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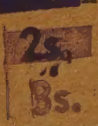

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**Insect Notes.—Extracts from Reports of the Entomological Division.**—*Agric. Jl. Union of S. Africa, Pretoria*, vi, no. 1, July 1913, pp. 87-92.

This article consists of extracts of general interest from the reports for April and May of the Division of Entomology. In April, locusts were reported from various parts. A single specimen of *Cyrtacanthacris septemfasciata* was found in the Lydenburg District. In spite of every precaution, a swarm of locusts was reported from the district between Baroda and Tafelberg. Probably the same swarm was the subject of another report from the same district, when the extent of the swarm was estimated at 20 square miles. Fruit moths (*Achaea* (*Ophiusa*) *lienardi* and probably other species) were reported from Lourenço Marques and from East London. The Bagrada Bug (*Bagrada hilaris*), infesting cruciferous crops, was reported from Pretoria and to a less extent from Lydenburg, Rustenburg, Warmbaths and other outlying parts of the Transvaal. Strong contact insecticides such as soap (10 lbs. to 20 gals. water) kill the pest, but are injurious to the plant. Lucerne and lawn pests caused considerable damage. Formulae are given for making mixtures for combating them; 20 lbs. of bran are moistened with a solution of 4 lbs. of sugar in water. In one case 1 lb. of Paris green is added; in a second 1 lb. white arsenic; and in a third 1 lb. arsenate of lead paste. Another formula is:—bran 20 lbs., sugar 8 oz., and Paris green 4 oz.

Five occurrences of Codling Moth (*Cydia* (*Carpocapsa*) *pomonella*, L.) were reported. From the May report, it is stated that two nurseries were quarantined. A list of the nurseries in quarantine to date is given.

The locusts reported in April laid eggs and infested roughly a triangle with its corners at Middelburg, Schoombie and Fish River. The swarms were not dense, and only slight damage was done. The species was not identified with certainty, but if it is not actually *Locusta pardalina* (= *Pachytylus sulcicollis* = *P. capensis*) it is a close relative. A few specimens of a parasite of the Fruit Fly (*Ceratitis capitata*) were given to the Division by Dr. Silvestri, who visited S. Africa in quest of them. These insects are being successfully reared and it is hoped to establish them out of doors on the coast of Natal, if not in cooler parts, after the winter. As they come from tropical regions, it is questionable whether they will thrive in the Union, but in view of their power of destroying the fruit fly, the effort will be made to establish them.

**Insect Notes from the Seychelles.**—*Ann. Rept. on Agric. and Crown Lands for the year* 1912, *Victoria, Seychelles*, 1913, pp. 15-17.

The author says that parasitic fungi to which he called attention in his annual report for 1911 [see this Review, Series A., p. 75] which had made their appearance on scale-insects in

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various localities, mostly above 1,800 feet elevation have continued their good work and have greatly relieved the Para rubber trees and coffee bushes.

*Lecanium nigrum* which attacks Para rubber is parasitised even in the low country by a species of *Hypocrella*. The other *Lecanium* found in the Colony are as follows:—*L. oleae* on *Ficus nautarum; L. hesperidum* on cassias; *L. tessellatum* on coffee, coconut and cinnamon; *L. longulum* on anonas; *L. frontale* on casuarina; and *L. viride* on coffee, citrus, ixora, etc.

The fungus known as *Cephalosporium lecanii* has spread to all parts of the Archipelago and keeps the green scale in check to such an extent that the planters are surprised to see their coffee bushes restored to health in an apparently mysterious manner. The author thinks that it will not be possible to spread this fungus in the low country except in very wet years, such as was 1912.

The small black ant, *Technomyrmex albipes*, which is the commensal of the scale-insects and materially assists them in their work of destruction, is still very abundant in all localities and has itself become a plague on account of its depredations. Attempts to destroy these ants have been made in two ways:—by tying paper bands round the trees smeared with a patented mixture called "adhesite"; or, as recommended by Professor Woodward, California, by placing a diluted solution of arsenite of soda in sugar syrup in receptacles, in such a manner that the ants would get to it and carry it in a continuous supply to their nests, where it might be fed to the queen and larvae. There are practical difficulties in the way of arranging for a regular supply of this poisoned syrup in a proper manner in consequence of the necessity of exposing the syrup to the weather, but the author says that he has seen bananas, which are ideal plants for attracting ants, rapidly cleared of them when the poisoned syrup had been distributed around them.

Chandler (W. H.). **Instructions for Spraying.**—*Missouri State Board of Agriculture.* Special Bulletin no. 57, N.D. (1913) 53 pp., 22 figs., 3 pls.

Of the stomach poison sprays, arsenic compounds are the chief ingredients; of the contact poisons, the most important are lime-sulphur, kerosene emulsion and the miscible oils. The cost of four sprayings is roughly estimated for trees varying from 12-18 years old in good soil at 4½*d.* to 6½*d.* for materials and slightly more for labour, but it is impossible to give any accurate estimate unless the size of the trees and other conditions be known.

The net gain by spraying apples, roughly estimated, is 5*s.* 5*d.* per tree. This is taking the income from a sprayed tree as 9*s.* 8½*d.* Here again it is only possible to give an average figure. The initial expenses, viz., the cost of equipment, must be taken into account when dealing with the profits of spraying. If the crop is steady year after year, the standing expenses of the equipment are much less in proportion to the profit than when the crop is irregular and subject to destruction by frost, etc.

The biting insects of the apple may be controlled by summer spraying. These are the Codling Moth (*Cydia* (*Carpocapsa*) *pomonella*, L.) and the Curculio (*Conotrachelus nenuphar*, Hbst.). The best spray is made up of lead arsenate: the paste should be used at a strength of about 2½ lb. to 50 gals. of water. The spray must penetrate to the base of the calyx, and should be repeated two or three times. The first spray is given as soon as the bloom falls and the second in about 2 or 3 weeks. The sucking insects of the apple are the Woolly Aphis (*Schizoneura lanigera*, Hausm.), the San José Scale (*Aspidiotus perniciosus*, Comst.), and the Oyster-shell Scale (*Mytilaspis pomorum*). For the Woolly Aphis a spray of 10 to 15 per cent. kerosene emulsion, to be sprayed about the roots, is recommended. The San José Scale may be treated by spraying with lime-sulphur mixture of about 1·03 sp. gravity, or by use of the miscible oils. The Oyster-shell Scale is best controlled by spraying with a 7 per cent. kerosene emulsion shortly after the bloom falls.

The insects of the pear that can be controlled by spraying are the same as those of the apple.

Spraying peaches is a more delicate process than spraying apples or pears, as the foliage is more susceptible to injury from most sprays. Bordeaux mixture should not be used, except when the foliage is off; Paris green should never be used. Lime-sulphur properly made is not injurious, and arsenate of lead can be employed, if not used more than twice during the first season and not after the foliage is old, and it should always be mixed with lime. The Curculio (*C. nenuphar*) should be combated with arsenate of lead; the first spray should be given just after the calyx has fallen; it should not be stronger than 2 lb. of the paste to 50 gals. water. A second spraying should be applied about three weeks after the first. The insects of the peach which are destroyed by other means are borers (*Sanninoidea exitiosa*, Say) and the Fruit-tree Bark-beetle (*Scolytus rugulosus*, Ratz). The borer is a serious pest: it is combated by digging out the larvae. The *Scolytus* does not attack healthy trees; all weak, infested trees and limbs should be cut down.

The chief insect pest of plums is the Curculio (*C. nenuphar*). It should be sprayed with arsenate of lead 2 lb., lime 3 lb., water 50 gals., about the time the calyx drops, and again in 2-3 weeks. This insect is also troublesome with the cherry and difficult to control. Spraying should be done as soon as the calyx is off, but no later spraying can be given, since the fruit ripens too quickly and is liable to be discoloured by the spray.

The insects of the grape are not serious in Missouri. Curculios (*C. nenuphar*) make feeding punctures in the autumn. This can be best controlled by covering the bunches with a paper bag, leaving a hole in the bottom for water to run out.

Strawberries are attacked by the Strawberry Leaf-roller (*Phoxopteris comptana*, Frohl.), the Strawberry False-worm (*Harpiphorus maculatus*), the May Beetle (*Lachnosterna fusca*, Frohl.), and the Crown Borer (*Tyloderma fragariae*, Riley). The surest remedy for the Leaf-Roller is to mow down the plants and burn the bed off after the strawberries have been picked. Spraying when the strawberries are about half-grown will kill the insect,

but it is difficult to spray strawberries, as they so soon ripen. The False-worm can be killed by spraying the leaves upon which it feeds, but the same objection applies. Powdered white hellebore (1 lb. to 3 gals. of water) may be used; it does not harm the fruit. The May Beetle feeds upon the roots of the plant; the remedy is to grow some crop other than grass or strawberries on the land until they are starved out. For the Crown Borer, rotation is also the remedy.

On gooseberries and currants the chief pests are the Imported Currant Sawfly (*Nematus ventricosus*, Comst.), and the Currant Spanworm (*Diastictis ribearia*, Comst.), which can be treated by spraying with arsenate of lead, and the San José Scale, treated in the same way as for apples.

On the potato, the Colorado Potato Beetle (*Leptinotarsa decemlineata*) and the Flea Beetle (*Epitrix cucumeris*) are the chief insect pests. The former may be treated with arsenate of lead 2½ lb. to 50 gals. water; the latter are not easily combated by spraying; Bordeaux mixture does good, though it does not kill the insect.

On the tomato, the common Tomato-worm (*Phlegethontius celeus*) the Cutworms and the Flea Beetle (*E. cucumeris*) are the most troublesome pests.

The Tomato-worm can be controlled by hand-picking, or by spraying with lead arsenate. Cutworms can be controlled to some extent by the use of poisoned baits.

The Weevil (*Bruchus obtectus*) is the most common pest of beans. It is combated by treating the seed with carbon bisulphide—1 oz. to 100 lb. of seed.

Cutworms, Cabbage-worms (*Pieris rapae*) and the Harlequin Cabbage Bug (*Murgantia histrionica*) are pests of the cabbage, cauliflower, kale, etc. Cabbage-worms are treated with lead arsenate spray, when the cabbage is about two-thirds grown. The Harlequin Bug cannot be controlled by a spray which will not also injure the plant.

Morstatt (H.). **Ostafrikanische Termiten II. Die Natal-termite und andere Arten auf Kautschukbäumen.** [East African Termites. The Natal Termite and other species attacking Rubber Trees.]—*Der Pflanzer*, *Dar-es-salaam*, ix, no. 9, Sept. 1913, pp. 443-463, 3 pls.

Two species of termites attacking rubber trees are described in detail, viz., the Natal termite (*Termes natalensis*, Hav.), and the black-brown termite (*Acanthotermes militaris*). The former has already been dealt with by Fuller (Agric. Journ. Union of S. Africa, iv., 1912, nos. 3 & 4). The present paper describes the various individuals of the termite colony and their life-history. The description of the nest differs very markedly from that of both Sjöstedt and Fuller, who describe it as a mound; the present author states that it lies below the surface of the earth. It begins at a depth of about 6 inches, and no trace of it can be seen from above. In the case of the rubber tree, the termite eats

into the cambium and the sapwood of the root, thence penetrating into the stem. In ordinary circumstances the inroads are confined to the wood, but if the weather has been unusually dry the termites turn to the sap for moisture.

Other species attacking rubber cannot be regarded as serious pests, and it is only in a few cases that they have been known to attack healthy trees. The following have been identified:—*Termes badius*, *T. redenianus*, *T. monodon*, *T. latericius*, and *Eutermes rectangularis*.

The difficulty in combating termites lies in the fact that, to do any real good, the nest must be destroyed, and owing to the subterranean habits of some of the species, the nest is often very difficult to find. Methods of combating attacks fall into two categories:—(1) Keeping the termites away from the tree, and (2) destroying the termites after they have once made inroads into the tree. Of the methods used for preventing the termites from reaching the tree, none can be described as satisfactory, except that of ridding the plot of ground of termites before planting the trees. Many chemicals were tried, such as carbon tetrachloride, carbon bisulphide, potassium cyanide, sodium arsenate, formalin, lysol and calomel. Their effect upon the nests were found to be nil or very slight, as is shown by an accompanying table. The method recommended as the best is that involving the use of the machine known as the Ant-destroyer, which is constructed to pump poisonous gases into the nest, filling every part of it. By its use the entire nest can be destroyed. As regards attacking the termites which have already eaten into the tree, experience up to the present has not taught very much; it is not known whether scraping off the bark on that part of the tree attacked, and, the removal of the earth in that region, give good results. In some cases a mixture of calomel and sugar has been tried with good effect.

Dewitz (J.). **Physiologische Untersuchungen auf dem Gebiet der Schädlingsforschung. II. Uber Wachstumshemmungen bei Insecktenlarven.** [Physiological Researches in connection with the study of pests. On the arrest of growth in insect larvae.]—*Sonderabdruck aus der Naturwiss. Zeits. für Forst- und Landwirtschaft, Stuttgart*, xi, pt. 9, 1913, pp. 431-440.

This paper deals at some length with experiments made upon developing larvae of certain injurious insects. The author is of the opinion that in the cases which he examined, decreased oxidation, following upon the separating out, or accumulation of toxins in the animal, or in consequence of self-poisoning, can be brought about. Larvae were kept in a warm temperature—which is said to act on the blood, destroying the oxydases contained in it—and the caterpillars obtained were only half the size of those grown under normal conditions. Larvae fed on the serum of sheep or snails also had their growth either arrested or decreased. The author holds that the serum prevented the formation of oxydizing enzymes (oxydases), and that the growth of the larva and the formation of enzymes go hand in hand. A good bibliography of the subject is given.

GRAF (A.). **Die Bedeutung unserer Vogelwelt für die Landwirtschaft.** [The importance of birds in agriculture.]—*Schweizerische Zeitschrift für Obst -und Weinbau, Frauenfeld,* xxii, no. 18, 26th Sept. 1913, pp. 282-285.

In a lecture delivered before the Cantonal Agricultural Society of Zurich the author states that some interesting experiments and observations have been made, leading to the conclusion that no small importance should be attached to the rôle played by birds in the destruction of insect pests. A blue titmouse, for example, will consume more than its own body weight in food each day. It may be estimated that a pair of these birds, with their young, require no less than 75 kilograms per year of living insects, their larvae, pupae or eggs. Three blue tits and three cole-tits consumed 8,000 to 9,000 insect eggs daily, and three marsh-tits, one cole-tit, a long-tailed-tit and a golden-crested wren consumed 600 caterpillars in 100 minutes. From these and similar results it follows that birds are a valuable asset in agriculture as destroyers of insect pests, and every effort should be made to protect and encourage them.

VASSILIEV (E. M.). ЧЕРНЫЙ СВЕКЛОВИЧНЫЙ ДОЛГОНОСИКЪ ВЪ ПОДОЛЬСКОЙ ГУБ НА ВЫСАДКАХЪ [*Psalidium maxillosum*, F., in the Government of Podolia on transplanted seedlings].—ТРУДЫ ОПЫТНОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ Всероссійскаго Общества Сахарозаводчиковъ за 1912 г [Studies from the Experimental Entomological Station of the All-Russian Society of Sugar-refiners for the year 1912]. *Kiev*, 1913, pp. 3–6.

On the 13th of April of last year two species of weevils (CURCULIONIDAE), found in the beet plantations of the Grushkov Refinery in the Government of Podolia, were sent to the Station. One of these proved to be *Psalidium maxillosum*, F. In Russia these insects are found in the Governments of Voronezh, Poltava, Podolia, Cherson, Ljublin, Taurida, and also in the Crimea, Caucasia and Turkestan. Little is known of the biology of this pest of the beet and vine, and its eggs, larvae and pupae are still unknown; it is assumed that it winters in the imago stage. As to its food, it was observed on plants of the orders Compositae (*Artemisia cirsium*), Cruciferae (*Lepidium draba*, L.), Chenopodiaceae (sugar beet), and also on the vine. As remedies, spraying with barium chloride, Schweinfurt green, or djipsin can be recommended; as the beetles cannot fly, trap ditches, with bait-wells at intervals along their bottoms, will prove useful for catching them. The author points out that the beetle feigns death when touched, which fact, coupled with its dark colour, leads him to assume that it feeds also in the day-time.

The other beetles sent to the Station were identified as *Tanymecus palliatus*, F. They injure the leaves of beets, as well as of some plants of the orders Papilionaceae, Cruciferae and Urticaceae.

Vassiliev (E. M.). ВАЖНѢЙШІЯ МѢРЫ БОРЬБЫ СЪ ЖУКАМИ И ЛИЧИНКАМИ КРАСНОГРУДАГО ЛИСТОѢДА, ПОВРЕЖДАЮЩИМИ ЯРОВЫЕ ЗЛАКИ [The chief remedies against the larvae and beetles of *Lema melanopus*, L., a pest of summer-sown grain].—ТРУДЫ ОПЫТНОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ Всероссійскаго Общества Сахарозаводчиковъ за 1912 г. [Studies from the Experimental Entomological Station of the All-Russian Society of Sugar-refiners for the year 1912]. *Kiev*, 1913, pp. 1–2.

During 1910 and 1911 the beetles and larvae of *Lema melanopus*, L., injured the leaves of oats, barley and summer-sown wheat in the neighbourhood of the Rubejan Sugar-refinery in the Government of Charkov. The insects ate out longitudinal strips of the parenchyma of the leaves, between the veins, causing the leaves to turn a white colour. Low-lying and wet spots are attacked first, and owing to the loss of chlorophyll the growth of the plants is delayed and the harvest of grain decreased by 25-50 per cent. and over. Oviposition takes place in April on the leaves of summer crops and meadow-grasses, more seldom on winter crops and maize. Greater damage is done by the larvae, which at the beginning of June or towards the middle of the month pass into the earth to pupate at a depth of 2-3 inches. In about a fortnight they assume the adult form, but do not issue from their cocoons until the following spring. Thus only one generation appears yearly, but usually all the stages are found simultaneously owing to the prolonged emergence period of the adults in spring.

As remedies are suggested, in the lower and wet places, spraying with 5 per cent. barium chloride, with 5 per cent. of molasses added; or with 0·17 to 0·2 per cent. of Schweinfurt green, with 0·6 per cent. of freshly slaked lime; or with a 1-2 per cent. solution of tobacco extract. Should the larvae appear in great numbers where no remedies have been previously applied, there remains nothing but to cut the damaged parts of the crop, dry the swath outside the field and use it as food for cattle. After the harvest is gathered from the infested fields, it is necessary to replough the stubble, so as to destroy the insects in their various stages in the earth. Prof. Lindeman suggests as a remedy the cultivation of winter barley and winter wheat, which are not attacked by the insects.

Faber (P.). **Vogelschutz im Weinbaugebiet.** [Protection of Birds in relation to Vineyards.] — *Luxemburger Weinzeitung, Grevenmacher,* i, no. 27, Oct. 1913, p. 468.

The writer says that in combating pests, natural conditions may be made use of, and refers particularly to the advantages gained by protecting and encouraging insect-eating birds, such as the swallow, redstart, wagtail and flycatcher in summer, and the tomtit and nuthatch in winter. In Mainz the protection of birds

has been developed on a large scale by the State. Artificial nesting-boxes are hung up, and these are almost invariably made use of by the birds in the breeding season.

Bodkin (G. E.). **Control of the Rice Worm.**—*Jl. Bd. Agric., British Guiana, Georgetown*, vii, no. 1, July 1913, pp. 53-54.

The author desires to call the attention of all rice cultivators to the following methods for stopping the attacks of caterpillars on young rice, and says that they will prove effective if properly carried out. The crops should be carefully inspected for caterpillars as soon as green shoots appear, and if any are found, specially prepared and finely powdered arsenate of lead should be dusted lightly over the plants, and this will quickly poison the caterpillars. The application can be made by beating the powder through light cloth sacks or by means of a dusting machine. As the caterpillars do most damage when the rice plants are only a few weeks old, flooding is a very effective method of destroying them. This can be arranged for by making the dams around the nursery beds sufficiently high that the plants can be completely covered with water. The caterpillars float off on the surface and may be easily collected and destroyed. When flooding is not possible, it is not difficult to have the caterpillars collected by children and dropped into a tin containing water and a little kerosene. Small perches for birds that eat the caterpillars should be placed in the nursery beds, actual cases have been observed where these have proved exceedingly useful. The ground around rice cultivation should be kept as free from grass and weeds as possible, as this is a great help in keeping the caterpillars away from rice. And finally, co-operation is absolutely necessary for successfully combating the pest in a number of ricefields lying close together.

Vuillet (A.). **La perceuse ascendante des tiges de rosier.** [The upward boring insect of the rose tree.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 5, 5th Aug. 1913, p. 74.

Two species of Tenthredinidae bore into the stems of rose trees, *Ardis bipunctata*, Klug, from above downward, and *Monophadnus elongatulus*, Klug, in the reverse direction. In the case of the latter species, the female deposits each egg in a depression made with her proboscis at the base of a petiole of a flower. The young larva leaves the base of the flower and pierces a hole in a young stem, which it enters. The passage it hollows out is always ascending, and is about 5 inches in length. The remedy is to introduce a fine iron wire into the hole; this kills the larva. The disadvantage of this remedy is that it necessitates much manual labour. In any case, at the time of gathering the flowering branches, it must be seen to that if the stem is cut through a passage, the part of the stem left below it shall also be cut away, so that moisture, etc., cannot enter the burrow and cause the decay of the branch.

Barsacq (J.). **Le Bombyx dissemblable ou spongieuse** (*Lymantria* (*Ocneria*) *dispar*, L.). [The Gipsy Moth.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 5, 5th Aug. 1913, pp. 70-73, 2 figs.

In this article the ravages of the gipsy moth in the Crimea are described. The remedy recommended is lead arsenate. *Lymantria dispar* is attacked at various stages of its development by natural enemies. Birds, with the exception of the cuckoo and the starling, do not devour the larvae, but there are many useful insect parasites, notably *Hadronotus* (*Telenomus*) *howardi*, Mokr., which in the Crimea destroys three-quarters of the eggs. The young caterpillars are frequently infested by *Apanteles fulvipes*, Hal., *A. solitarius*, Rtzb., *A. glomeratus*, L., *Pristomerus vulnerator*, Pz., *Echinomyia fera*, L., *Tachina larvarum*, L., and *T. rustica*, Mg., etc. The adult larvae and the pupae are attacked by *Sarcophaga affinis*, Fall., *S. albiceps*, Mg., *Parexorista lucorum*, L., *Roeselia antiqua*, Mg., *Scotia saturniae*, R. D., *Pimpla instigator*, F., *Theronia flavicans*, F., and others of minor importance.

Vuillet (A.). **La lutte contre la Cécidomyie des poires.** [Combating Cecidomyia in Pears.]—*La Revue de Phytopathologie appliquée, Paris*, i, no. 5, 5th Aug. 1913, p. 74.

Cecidomyia (*Diplosis pirivora*, Riley) is one of the most harmful pests of pear trees. In certain districts near Paris, the larvae of this minute fly enter the young fruit and damage half the crop. In the district of Châtenay, where a big revenue is drawn from the cultivation of pears, the municipality have taken up the question of the destruction of *D. pirivora*. In spring, one franc per kilogram is offered for pears attacked by the parasite, which have to be brought to the local government offices in the town; pears which have been picked up from the ground and which the insect has left are refused; 1000-1500 kilograms of pears are brought each year. A still larger quantity is destroyed by cultivators, who do not trouble to claim the money. This method is found to give excellent results. Insecticides, used to prevent the laying of eggs are, according to the experiments of Dr. Marchal, not to be recommended; the same applies to setting up obstacles to prevent the development of the adult in spring. On the other hand, the same author obtained good results in attacking the hibernating larvae by spraying with sulphocarbonate of potassium, very dilute, about 30 kilograms (66 lb.) to the are (120 sq. yds.). It would be interesting to know if this method has been tried anywhere on a large scale, as the experiment in question was made only on a small area.

Jones (C. R.). **The Tobacco Caterpillar** (*Prodenia litura*, Fabr.)—*Philippine Agric. Rev., Manila*, vi, no. 9, Sept. 1913, pp. 425-432, 2 figs., 1 pl.

Tobacco is almost the principal staple crop of the Philippines, the chief tobacco district being in Northern Luzon, in the

Provinces of Cagayan and Isabela. The greatest pest in these areas is *Prodenia litura*, F., the larva of which attacks growing tobacco both young and old; but the principal damage is done to the young leaves, as even a small hole made in the bud or growing leaf assumes considerable proportions as the leaf develops. This cosmopolitan pest is present in districts where tobacco is not cultivated, and often attacks other garden and field products. The insect has frequently been reported from the Visayan Islands as damaging corn, and from the Province of La Union as damaging tobacco. It also occurs throughout the Cagayan Valley, especially in the tobacco fields from Lal-loc to San Luis. It is known throughout that district as the "camarin worm" and is believed by the natives to develop in the camarins or sheds, in a single night. The larvae can be found in their various stages at almost any time wherever a castor-oil plant occurs, as they are particularly fond of its succulent leaves. They are unfortunately general feeders, and the author gives the following list:—tomato, tobacco, calaboa (*Monochoria hastata*), maize, cabbage, rice, sweet potato, castor (*Ricinus communis*) and jimson-weed (*Datura* sp.).

Lefroy gives the following as its food-plants in India:—lucerne (*Medicago sativa*), abundant in irrigated lands; jute (*Corchorus capsularis* and *C. olitorius*), feeds upon the succulent apical shoots; indigo, not especially serious; potato, cutting off young plants; marua (*Eleusine coracana*), scarce; urid (*Phaseolus radiatus*), occasionally; *Coleus*, occasionally in gardens; mulberry (*Morus alba*), pakur (*Ficus infectoria*), ground-nut (*Arachis hypogaea*), tur (*Cajanus indicus*), sugar-cane (*Saccharum officinarum*), agathy (*Sesbania aegyptiaca*) and dhaincha (*Sesbania aculeata*).

The eggs are laid on the leaf in clusters of from 35 to 500 each. The mass usually contains 3 layers, and the whole is covered with short buff-coloured hairs from the anal tuft of the moth, and in the author's opinion this hairy covering undoubtedly acts as a protection against parasites. The time of hatching of the eggs in each mass is fairly uniform. The larvae feed on the epidermis of the leaf, working from the underside and keeping close together in masses for 3 to 5 days, completely skeletonizing it. The first moult occurs from 2 to 4 days after hatching, the second 3 days after the first; altogether there are 5 moults. The average duration of the larval stage was found to be 17 days, and that of the pupal stage about 10 days; the total life-cycle about 35½ days. Oviposition takes place early in the evening and at night, and the moths live in the laboratory from 4 to 8 days when fed on sweetened water, but the author thinks that life is undoubtedly longer under natural conditions. Parasites and predaceous enemies play an important part in the natural control of this pest. In spite of the hairy covering of the eggs, two small hymenopterous parasites have been bred from them in large numbers. A large Tachinid fly has also been bred from the larvae and a large black "mud-dauber" wasp was observed several times carrying off the larvae. Birds also consumed large numbers, but to what precise extent has not yet been determined.

Spraying with Paris green or arsenate of lead may be employed, the latter being preferable as it does not damage the plant. Hand-picking is easily carried out, as the egg-masses are not difficult to find, and the author advises that crops should be examined at intervals, and as soon as the pest is discovered active measures should be taken. He suggests that lantern traps standing in a basin of water and kerosene placed about the tobacco gardens would be useful.

Soroтzko (A.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ Тульской Энтомологической станціи за 1912 годъ [Report of the Entomological Station of the Government of Tula for the year 1912]. *Tula*, 1913, 39 pp., 1 fig.

The Clover-seed Apion oviposits as a rule inside the flower, previously piercing a hole through the calyx and corolla with its proboscis. The eggs look very like the anthers of clover, for which they may easily be mistaken. Some observations conducted during 1912 have proved that the females may also deposit their eggs on unopened leaf- or flower-buds. In the summer, when the clover is mown for hay, the rapidly growing aftermath contains plenty of young buds on which the females hasten to oviposit: as the blossoms appear, the number of eggs deposited on the former decreases. The larvae appear to be able to develop in such embryonic buds, increasing in size with their growth. A table is given showing that the females oviposit indiscriminately on blossoms with or without seeds in them. Investigations were further conducted with a view to ascertaining whether the mowing of clover influenced the breeding of the insects, and tables of results are given which tend to show that the effect is but slight: so that the mere mowing of the clover without previous disinfection cannot be recommended as a practical remedy against *Apion*.

The following sorts of clover were not infested by the insects:— *Trifolium resupinatum*, *T. repens*, *T. hybridum*, *T. incarnatum*, *T. montanum* and "rose clover." All these, except *T. incarnatum*, have a comparatively long flower-stalk, while the head is soft, with somewhat loosely set flowers which makes it unsuitable for the larvae and pupae of the insect. In *T. incarnatum* the calyx is thickly covered with small hairs, which possibly prevent oviposition. The varieties of clover attacked by the insects are those in which the flowers are closely set.

A table is given containing comparative figures regarding the infection of Baltic, local, Perm, Poltava and German sorts of clover; these figures, however, are not considered to be conclusive. The flowers of clover of the second crop are less injured than those of the first.

The remedies suggested are, the mowing down of the clover in the middle of June, keeping the aftermath for seed, and spray-

ing. When mowing, a bait strip may be left, which attracts the insects, and they can then be destroyed. The insecticide recommended is a solution of Paris green (about 1½ lb.), freshly slaked lime (about 3½-4 lb.) and molasses (about 7-8 lb.) in about 112 gallons of water. The cost of spraying is calculated at about 35 kopeks (9*d.*) per dessiatine (2.7 acres).

The copulation of the beetle was noticed in nature in the middle of May; the duration of the egg-stage was on the average 6·6 days (in 1911, 7·5 days) of the larval stage 17·6 days (in 1911, 16·8 days), of the pupal stage 8·4 days (in 1911, 9 days). The whole cycle occupied on an average 32·6 days (in 1911 33·3 days).

The infection of the insects by parasites was not great in the year under report; only in one case did it amount to 50 per cent. A table is given of the percentages of infected insects in different parts of the Government at various dates, showing a range from 2 per cent. to 50 per cent.

*Euxoa segetum*, Schiff., in 1912 destroyed 13,632 acres of crops in the Government. The first generation appeared on the 9th June, reached its maximum on the 24th June, and disappeared on the 27th July; the flight of the second generation began on 5th September. The rainy weather in August prevented further observations.

*Oscinis frit*, L., damaged spring wheat and barley in some parts. An analysis of different sorts of wheat showed that the damage done increased from 26 per cent. in Swedish, to 30 per cent. in Beloturka, 48·9 per cent. in Mlka, 74·6 per cent. in Saratovka, to 88 per cent. in Shlanshed wheat. Winter crops contained a smaller percentage of damaged heads.

Three generations were observed; the first, having hibernated, appeared from the middle of May, and oviposited on the spring crops; at the end of June the second brood appeared, and laid their eggs on spring and winter wheat, as well as on wild grasses; the last individuals of this brood overlapped the third one, which hatched out from the end of July, the flight stopping on the 26th August.

*Mayetiola* (*Cecidomyia*) *destructor*, Say, was found in small numbers, chiefly on winter crops. A table is given showing its distribution in the Government. Two generations could be traced; the first one flew in the early spring; its larvae were found at the end of June, and the cocoons at the beginning of July. The second generation of flies appeared from the 2nd August and continued flying during the whole of August and the first week in September. The insects winter mostly in the larval stage, and only a few as pupae.

It is mentioned that in 1913 the programme of the work of the station will include investigations and observations on beetles of the family Elateridae; on *Hylemyia coarctata*, Fall., which has caused considerable damage during recent years; on *Cydia pomonella* and on *Phlyctaenodes sticticalis*, which appeared in great numbers in some localities during 1912.

Vassiliev (E.). ЭНТОМОЛОГИЧЕСКОЕ ОТДѢЛЕНІЕ ОТЧЕТА О ДѢЯТЕЛЬНОСТИ ОПЫТНОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ—Отчетъ и Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиковъ [The Entomological Section of the Report of the Experimental Entomological Station of the All-Russian Society of Sugar-Refiners for 1912]. *Kiev*, 1913, pp. 12–33.

The report consists of two parts, the first of which deals with the pests of sugar-beet. *Bothynoderes punctiventris*, Germ., one of the most important chronic pests, appeared also last year, but did not do much damage, owing to the rainy weather, which is unfavourable to the weevil, and favours the development of the muscardine fungus, which attacks its larvae, so that it may be expected that in 1913 there will be a relatively small appearance of these insects. Some insects collected on the 24th May oviposited on the 30th May to 4th June. The author discusses spraying apparatus and praises the Vermorel 14-spray horse-traction machine.

*Tanymecus palliatus*, F., is found in European Russia as far north as Vologda and as far south as Taurida, and from Poland to Voronezh. It feeds on plants belonging to the orders Urticaceae, Chenopodiaceae, Papilionaceae and Compositae. Its eggs and larvae are still unknown. On beets the weevils are found singly and damage the seedlings. It is likely that it winters in the imago stage, as it is found in the middle of March, and as late as the beginning of November.

*Sitones lineatus*, L., is often found on beets, and some authors (Mokrzecki, Pospielov) consider it to be a pest of these plants, while Jablonovsky disputes this statement, it being in his opinion a pest of Papilionaceae exclusively. To clear up these conflicting statements experiments were conducted at the Station, which entirely confirmed Jablonovsky's conclusions.

An Elater, *Limonius pilosus*, Lec., was found near Smiela after the 26th June on beets and various other plants, feeding on the nectar and the stigmata. It was not possible to observe the oviposition, nor were the eggs found. It was noticed that these insects were devoured by the Carabid beetle, *Broscus cephalotes*, L., which also devours other beetles of the same genus, and owing to its long life (from April to October) its importance in this respect is very great. The remedies suggested against *Limonius* are:—The planting of potatoes, which free the fields from the pest for the next year; the use of mineral manures; and the dressing of the seeds (of maize) with white arsenic, which it is noted is not touched by the larvae of *Agriotes lineatus*, L. As another species of the family Meloidae, *Epicauta erythrocephala*, Pall., is known to injure leaves of beets and other plants, the author conducted some investigations at the Station, in company with M. A. Prick, which have shown that *Meloe proscarabaeus* also eats the leaves of beets in the presence, as well as in the absence, of other food. This insect oviposits in the earth, each female laying up to 1,500 eggs; *E. erythrocephala* lays its eggs in the egg-masses of locusts, on which the larvae feed; therefore its destruction cannot be recommended.

*Opatrum sabulosum*, L., is found very often in beet-plantations, but the experiments as to its food conducted at the Station in 1912 did not prove conclusive. The beetles refused wheat, oats, sometimes ate and sometimes refused peas, gnawed small round holes through the leaves of beets, while at other times they ate these leaves only very little and even refused them, perishing without attempting to eat. Similarly, it has been observed that *Blaps lethifera*, Marsh., sometimes eats the leaves of beet, but the real extent of the injury done remains uncertain.

*Cassida nebulosa*, L., were found last year in considerable numbers in various parts of the beet-growing region. In July they were also found on vines growing in sandy soil, but no injury was noticed. The destruction of goose-foot (*Atriplex laciniatum*, L.) is the primary remedy against this insect, especially in wet years when chemical remedies are useless. *Cassidula nobilis*, L., was found in small numbers. *Lethrus apterus*, Laxm., was sent to the Station from the northern part of Volhynia (50° 40″ N. Lat.), this being its northern limit. Experiments at the Station show that these insects feed on leaves of beet and of *Camelina sativa* (Siberian oilseed), on wheat, oats and sainfoin; the two latter plants have never been known to be attacked by it before. *Anisoplia deserticola*, Fischer, were found in beet plantations on one estate (Kapitonov) in such large quantities that during one day (12th June) about 15,000 specimens were collected; the insects usually kept on the borders of the plantations and injured the summits of the inflorescence, the latter turning black; the insects did not fly much and could be easily collected by hand. They were noticed only on the transplanted plants, not on the sprouts of the sown beet. Owing to hand-picking their numbers diminished considerably to the 18th June. This insect is known in Tyrol, Hungary and South Russia, and lives in sandy meadows, chiefly on spots covered by *Artemisia campestris* and *Cytisus* and surrounded by pine or oak woods. The specimens sent to the Station differed from the typical ones by the presence of narrow black stripes on their elytra, apart from the black suture and the black borders. [Lebedjev considers that the species has been incorrectly determined and that it is really *Blitopertha lineolata*, Fisch.]

*Phlyctaenodes sticticalis*, L., was found last year in Podolia, Kiev and Charkov; the first generation was more numerous, and the beets injured by the caterpillars, yielded less sugar. The author mentions the usual remedies against the insects and points out that the burning of sulphur, with or without dung, to keep away the females from a particular spot and thus prevent oviposition there, cannot be considered adequate. The success of this remedy depends to a large extent on the direction and force of the wind. The eggs are sometimes carried by wind, owing to their being deposited on the seed-capsules of various weeds. The eggs of the second generation were to a small degree infested by a Chalcid parasite. Excluding the activities of parasites and rapacious insects, the rare appearance of the more dangerous second generation is due either to infertility or to the great percentage of caterpillars which die in the two early stages.

*Aphis euonymi-papaveris*, L., appeared, notwithstanding the rains, on the 25th June on the summits of beet stems, but before the blossoming their numbers were not great. They appeared in larger numbers on the male flowers of maize, the colonies consisting of winged and wingless specimens.

Larvae of *Lecanium corni* var. *robiniarum*, Marchal, were found by the author in April 1912 on a field of oats, which field was under beet-cultivation in 1911. Some roots of beet remained in the fields over the winter under some Robinia trees and the larvae hibernated on the petioles and leaves of the beets. There were also found on the same leaves specimens of *Tetranychus telarius*, eggs of which were observed as early as 26th April.

*Pegomyia hyoscyami*, Pz., was comparatively rare; while *Julus unilineatus*, Koch, appeared frequently during the early spring on sprouts of transplanted beets (24th April–5th May). They were found chiefly in fields in which transplanted beets had been grown in the previous year, less frequently on red beet and sugar-beet.

The following pests of other cultivated plants are noted:—

*Cicadula sexnotata*, Fall., appeared in May on oats. On the 23rd May some parasitised specimens were found; according to N. V. Kurdjumov the parasites were probably Microhymenoptera. [The description suggests Stylopidae].

*Phyllotreta vittula*, Redt., was observed by the author in masses on maize and *Setaria italica*, eating the leaves; in one spot which was better manured the beetles were notably fewer.

Other insects found on maize were, *Cassida subferruginea*, Schrk., *Lema cyanella*, L., *L. melanopus*, L., and *Anthothrips aculeata*, Fabr. *Entomoscelis adonidis*, Pall., appeared early in the spring on *Camelina sativa*, cabbages, and poppy. On the 26th June some of the beetles were found in the earth at a depth of 6-9 inches in a state of aestivation which lasted up till August. On the 13th September pairing was noticed and on the 16th September heaps of eggs were found on the earth. Small numbers of *E. sacra*, L., were also observed.

*Dorcadion equestre*, Laxm., was found in April in ditches round some beet-plantations. Experiments conducted at the Station showed that the insects do not touch beets, but feed freely on leaves of oats, wheat and sainfoin. *Anisoplia segetum*, Hbst., was found in May on rye.

*Aphis gossypii*, Glov. (*A. cucumeris*, Forbes, *A. forbesi*, Weed) was found by the author in July on melons and cucumbers, this being the first record for the species from the Government of Kiev. The larvae of a weevil, *Stenocarus fuliginosus*, Marsh., were found on poppy roots in Podolia.

*Haltica ampelophaga*, Guér., is found in Russia in Bessarabia, the Crimea and the Caucasus, injuring the leaves, buds and young shoots of vines. A spray of Schweinfurt green is usually applied; some authors recommend also Bordeaux mixture, before the period of oviposition. The author also found on vines another flea-beetle (*Longitarsus* sp.), but in small numbers. *Sitones lineatus* and *Cassida nebulosa*. *Notoxus monoceros*, L., and *N. cornutus*, F., were observed on vines in July. These

Anthicid beetles, besides feeding on the nectar of the flowers of beet, eat also the stigmata of the ovaries. The larvae of *Polyphylla fullo*, L., are very dangerous to vines (as well as to pines) on sandy soils.

*Hyponomeuta malinellus*, Z., *Rhynchites pauxillus*, Germ., and *Anthonomus pomorum*, L., were noticed on apple trees; while on pear trees were found *Psylla pyricola*, Först., *Malacosoma neustria*, L., and *Gastropacha quercifolia*, L.

Cherries were injured by *Eriocampa adumbrata*, Klug, the larvae of which were found by the author in his garden up to the 30th September. *Anthonomus rectirostris*, L., was noticed on the common bird cherry in April. Evidently it winters on morello, feeds in the early spring on the blossoms, and oviposits inside the still soft kernels of cherries and peaches.

*Gossyparia ulmi*, L., was found in colonies on the bark of young elm trees in the Government of Charkov in May, being also known in Cherson and Kiev. The best remedy, according to I. J. Shevirev, is to smear the trunk with turpentine or "fotogen." *Kermes variegatus*, Gmel., were sent from the Suntchank Forests from oak bark; some females produced parasites. The oak trees are also injured every year by *Haltica quercetorum*, Foucr., the insects hibernating either in the bark or in the earth. In the spring of the next year the females oviposit on the lower part of the leaves, where the larvae remain skeletonising the leaves and pupate in July. Two weeks afterwards the beetles appear and skeletonise the leaves up to the time of the commencement of frosty weather.

*Sciaphobus squalidus*, Gyll., was found in April on buds of some fruit trees, also on *Euonymus*. Copulation took place at the beginning of May, and in the middle of the month heaps of white eggs were found on the ends of leaves turned up by the females. It is assumed that this insect migrates in its first stage, but it is not known whither, nor on what it feeds.

*Pteronus hortensis*, Htg., was found on *Robinia pseudacacia* in the Government of Kiev, this being probably the first record for Russia. The female deposits its egg inside the leaf on the under surface.

Dobrovljansky (V.V.). ВРЕДИТЕЛИ ПОЛЕВОДСТВА И САДОВОДСТВА ПО НАБЛЮДЕНІЯМЪ КІЕВСКОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ ВЪ 1912 ГОДУ [Pests of fields and orchards according to observations made at the Kiev Entomological Station in the year 1912.]—Published by the Entomological Station of Kiev of the South Russian Society for promoting Agriculture and Agricultural Industries. *Kiev*, 1913, pp. 14.

Most of the experiments conducted on the larvae of *Bothynoderes punctiventris*, Germ., did not succeed, as they would not live in captivity. Of the larvae collected underneath beet-roots in the fields more than half perished, being infected by the

muscardine fungus. The results of some experiments on spraying the larvae with (1) 1 per cent. Korsun green, and (2) 1½ per cent. Korsun green with 1 per cent. slaked lime, are given in a table: from this it appears that the former insecticide, under natural conditions, destroyed from 7½ per cent. to 22 per cent., and the second from 18 per cent. to 36½ per cent. of the larvae (in three successive days). The first pairing was noticed, in the laboratory, on the 9th May, oviposition proceeding from the 14th May till the 9th July; the larvae appeared about 11-12 days later. *Cassida nebulosa*, L., has done some damage to beets in the Government, although the injury was not serious, owing to the fact that the larvae migrated on to the beets from goosefoot, on which the eggs were laid, only a short time before pupation. The most suitable insecticide proved to be a 6-7 per cent. solution of barium chloride. Two generations were noticed.

*Simaethis pariana*, Cl., was found in large numbers in the Government of Tchernigov, and although not seriously injuring apples, deformed them. All stages could be found at the same time. A large percentage of caterpillars were infected by parasites.

*Cydia* (*Carpocapsa*) *pomonella*, L.—The results of some experiments with tanglefoot belts, which are given in a table, show that during 2 months on 10 belts there were found 93 caterpillars of *C. pomonella*. A table is also given showing the effects of three insecticides used: Schweinfurt green, Korsun green and Akridin. Some parasites were imported from Astrachan (by J. F. Schreiner), viz., *Trichogramma semblidis*, Aur., and *T. carpocapsae*, Ashm. The former was found to attack the eggs of various moths, preferring those of *C. pomonella*, *Euproctis chrysorrhoea*, L., and *Barathra* (*Mamestra*) *brassicae*, L. After this parasite had multiplied in the laboratory, the insects were released in two orchards and later observations proved that all the eggs of *C. pomonella* found were infected by them. *C. pomonella* is the most widespread pest of orchards in the Government of Vitebsk, where only one generation is observed. In the northern part of the Government of Tchernigov the insect has destroyed about three-fourths of the apple crop.

*Pandemis cerasana*, Hb., was found in an orchard in Kiev; the moths flew from the 15th June, paired on the 17th and began to oviposit on 19th. The caterpillars appeared about 10 days later; they pupate between two uninjured leaves drawn together. *Tmetocera ocellana*, F., was also found in the same orchard; its larvae live at first on the leaf-buds or blossoms; later on they feed on the leaves. The first pupae were found on the 6th June. *Capua reticulana*, Hb., has done considerable damage to fruit-trees, the larvae injuring the leaves and when further developed attacking also the fruits. The first moths appeared on the 6th August. The eggs are laid on leaves of apple and plum, and on currants, in heaps of 95-160 eggs. They were parasitised by *Trichogramma semblidis*, Aur., and *T. carpocapsae*, Ashm., the latter parasite being found more frequently. On the 4th September the percentage of eggs infected was 38·3 rising to 55·5 per cent. on the 23rd. As this insect is

attracted by light it is recommended to put out at night troughs containing molasses and water, with lamps suspended above them.

*Euxoa segetum*, Schiff.—The first generation flew from the 3rd June. In 7 troughs containing molasses, between 10th and 30th June, 37 specimens of *E. segetum*, 27 of *Feltia exclamationis*, L., 16 of *Euxoa conspicua*, Hb., and 3 of *Plusia gamma*, were caught. The second generation flew from the 5th to 31st August and in the same number of troughs were found during this time, 46 specimens of *E. segetum*, 29 of *E. conspicua* and 6 of *F. exclamationis*. In 5 troughs put out on another estate there were found between 24th May and 20th June, 4,395 specimens of *E. segetum* (1,582 males and 2,813 females), also specimens of *Barathra brassicae*, L., and *Scotogramma trifolia*, Rott.

In the Government of Vitebsk, where there is only one generation, in June, the insects have appeared in great numbers, injuring winter-sown crops. They have also injured tobacco-plantations in the Government of Tchernigov. One female began ovipositing in an observation case on the 7th September, laying about 150-300 eggs daily; up to the 22nd September 1,760 eggs had been deposited.

The second brood of *Cladius albipes*, Klug, appears in the middle of June; the females, fecundated or not, oviposit on the central vein of the leaves of cherry trees; the larvae appears 8 days later, developing in about three weeks, when they fall to the earth and pupate in grass or fallen leaves. In about 9-12 days the imagos appear. The injury done to cherry is sometimes very serious. *Cephus pygmaeus*, L., has done some damage to winter-sown wheat, being seldom found on oats. The larvae were found after the 9th July. The injuries were noticed only on fields damaged by *Mayetiola* (*Cecidomyia*) *destructor*, Say.

The puparia of the latter fly were found on some estates after the 21st July; of 135 puparia collected on the 21st-25th July 79 were empty, while out of the remainder there issued up to 17th August 3 specimens of *M. destructor* and 20 parasites. The third generation started flying at the beginning of August and continued through the month, some of the pupae hibernating, while a fourth generation appeared at the beginning of September.

Results of trap-crops for *Oscinis frit*, L., are reported. On one estate on a trap-crop of barley, sown on the 21st May, the first young larvae were observed on the 5th June, while on the 15th June the puparia were noticed; the flies issued from the 6th July to 2nd August, when the crop was ploughed in. The percentage of infested sprouts was 45; 21 per cent. of the cocoons were infected by parasites. A second trap-crop of oats on the same estate sown on the 11th July yielded the first larvae on the 23rd July, the first puparia on the 6th August and the first flies on the 12th September. The percentage of infested sprouts was 55, the percentage of cocoons infected by parasites 16. The insects of the third generation were also found on some estates on the sprouts of fallen grain, the percentage of infested sprouts being about 10 on the

26th August; while on the 5th September the percentage of infested winter wheat was 20-25. The infestation of the trap-crops was the greater the nearer these were to the main crops; sowings made on fallow land were less attacked. The reploughing of these spots required also the heavy rolling of the soil, in order to be successful, as otherwise the flies freely emerged from underneath the earth. From the 24th August to the 10th November the insects were mostly in the larval stage, in which stage the majority of them wintered. On oats, on one estate were also found together with *O. frit* specimens of *Oscinis pusilla*, Meig.; its larvae were found throughout July, its puparia, in the beginning of August, the flies emerging at the end of that month. The percentage of infected grains was 1-2 on the average, rising to 10 in some places.

БЮЛЛЕТНІ О ВРЕДИТЕЛЯХЪ СЕЛЬСКАГО ХОЗЯЙСТВА И МѢРАХЪ БОРЬБЫ СЪ НИМИ [Bulletins on the pests of agriculture and methods of fighting them. Issued by the Entomological and Phytopathological Bureau of the Zemstvo of Charkov. These Bulletins are issued on the 7th or 8th of each month. To avoid repetition of the full titles the abstracts have been arranged under the authors' names in order of date.]

AVERIN (V.G.). Объ ожидаемомъ появленіи вредителей въ 1913 году [On the expected appearance of pests in 1913].—Bull. no. 1, 7th April 1913, pp. 1–6.

The author points out the probability of the appearance of the following insects in great numbers and the necessity of timely preventive remedies against them. His estimates are based on information collected as to these insects during 1912.

*Hyponomeuta malinellus*, which takes the first place amongst orchard pests and which has been prevalent in nearly all parts of the Government, was expected to appear again in large numbers in the current year. It is reported that in some districts the caterpillars were infected before pupating by a small parasite, *Ageniaspis fuscicollis*. *Aporia crataegi*, although not found everywhere, takes the second place, and in some districts it is necessary to guard against it. *Cydia (Carpocapsa) pomonella* was found everywhere, decreasing the harvest of apples by 10-15 per cent. in nearly every orchard, while in some the damage amounted to nearly 50 per cent. *Euproctis chrysorrhoea*, which was a serious pest a few years ago, has nearly disappeared; this may be due to parasites.

*Anthonomus pomorum* was likely to be prominent and injurious to about the same degree as *Cydia pomonella*; while the activities of *Epicometis hirtella*, L., were likely to be limited to a few districts.

The following insects were also expected to appear in more or less large numbers:—*Lymantria dispar*, many larvae of which

perished in 1912 owing to the parasite *Apanteles fulvipes*; *Malacosoma neustria*, whose caterpillars also suffered from parasites; *Rhynchites pauxillus; Psylla mali; Chortophila brassicae; Phlyctaenodes sticticalis*; and *Lethrus apterus*.

The author points out the necessity of early destruction of the nests of *Aporia crataegi* and of *Euproctis chrysorrhoea*, as well as of the eggs of *Lymantria dispar*, mentioning also insecticides for spraying the latter. As to *Anthonomus pomorum* and *Rhynchites pauxillus*, tanglefoot belts are suggested. Timely spraying is recommended against *Psylla mali*, either with tobacco extract (1 lb. in about 5 gals. of water) or with the following decoction of quassia: 3 lb. boiled in about 5 gals. of water; half of the water evaporates, when another 2·7 gals. of water are added and the liquor racked off; 2 lb. of green soap are then added, and the whole made up to 16-17 gals. with water.

Averin (V.G.). Текущія работы въ маѣ [Operations to be undertaken in May].—Bull. no. 2, 8th May 1913, 13 pp.

If no early spraying has been done and the caterpillars of *Aporia crataegi* have appeared in large numbers it is recommended to spray the attacked trees with Paris green (about 5 drams of green in ½ pint of salammoniac, dissolved in about 40 gallons of water). At the end of May a new generation of these caterpillars is likely to appear, when the spraying must be repeated in time. The same remedy is also suggested against *Lymantria dispar*, *Malacosoma neustria* and *Euproctis chrysorrhoea*. Information has reached the Bureau as to the appearance of *Rhynchites giganteus* in one district. For this and other weevils the author recommends shaking the trees over sheets during cool weather in the morning and evening, when the insects are sluggish; this shaking may also bring down the buds attacked by *Anthonomus pomorum*, which buds ought to be collected and destroyed. Spraying with barium chloride (4½ lb. to 27-30 gals. of water) is also suggested; but this is effective only during hot weather when the sun's rays kill the paralysed insects.

*Hyponomeuta malinellus* is reported from all parts of the Government; the caterpillars had already left the mines inside the leaves on the 28th April and settled down in dozens on their surface. Spraying with Djipsin, Paris green, barium chloride, or tobacco extract is recommended. In addition to the usual sprays and tanglefoot belts to protect apples against *Cydia pomonella*, it is recommended that each fruit should be tied up in a small paper bag, the bags being removed shortly before ripening in order to allow the apples to colour.

*Phyllotreta nemorum* has attacked market gardens, and especially seed cabbages, in the district of Charkov; remedies such as fumigating with tobacco in hot-beds, spraying with barium chloride or wormwood extract, the placing of horse-dung between the beds, and the sifting of ashes on the leaves of the cabbages, as well as on the earth, are suggested. The same remedies apply to *Phyllotreta vittata*, Redt.

Averin (V.G.). Текущія работы въ іюнѣ [Operations to be undertaken in June].—Bull. no. 3, 7th June 1913, 7 pp.

Reference is made to a serious outbreak of *Phlyctaenodes sticticalis*. The insects appeared in the middle of May, increasing daily, and by the 23rd of the month their numbers reached the maximum. The moths oviposited in enormous quantities, chiefly on the lower sides of the leaves of weeds and market-garden plants (cabbages, cucumbers, pumpkins, melons, &c.) as well as on maize, lucerne, sunflowers and beets; they avoided grasses. The preventive remedies suggested are tanglefoot belts, and spraying with Paris green or azurgin. Destructive remedies:—spraying with tobacco emulsion, carbolic emulsion, barium chloride, or naphtha emulsion. Recipes are given for the preparation of these insecticides, and suggestions are made as to the best forms of sprayers.

*Lophyrus pini* has appeared in many parts of the Government on pines. Trees of 4–8 years are especially subject to its attacks, on which it devours all the needles of the previous year. As remedies, hand-picking, followed by crushing by means of special gloves, and spraying with barium chloride (4½ lb. in 27 gals. of water) are recommended.

Spraying with Paris green proved very effective against *Nematus ventricosus*, the larvae of which have damaged currants. *Phytoptus piri*, the punctures of which cause the so-called "scab" of pears, was reported from one locality. Spraying with tobacco extract (1 lb. in 2·7 gals. of water) as soon as the spots appear is recommended.

*Arctia caja* appeared in a pine forest near Balaklei, attacking various wild and cultivated plants, such as melons, cucumbers, French beans and wild vine. A large percentage of the caterpillars were found dead from some cause unknown. *Retinia buoliana* has also attacked young plantations in the same forest. As a remedy the collection and burning of the attacked plants was practised. *Melolontha hippocastani* was noticed on the wing in the same locality; it did not appear the previous year, but the author remarks that he observed it in great numbers in 1911.

*Lema melanopa* damaged oats and barley in some districts; spraying with Paris green was used against it with some success. *Hyponomeuta malinellus* covered the apple trees with their webs early in the season in all the orchards of the Government. Spraying with barium chloride (4½ lb. in 27-30 gals. of water) proved the most effective remedy. *Aporia crataegi* has seriously injured orchards in one district. The collected material showed only a small percentage of caterpillars and cocoons infested by parasites, so that a heavy flight of the insects may be expected later. It is recommended to spray the trees with Paris green at the end of July, when the small caterpillars will appear. *Rhynchites bacchus* is reported from one district, barium chloride being used as a remedy. In some parts of the district of Charkov, Thrips has damaged rye, about 50 per cent. of the ears being injured.

Averin (V.G.). Текущія работы въ іюлѣ [Operations to be undertaken in July].—Bull. no. 4, 8th July 1913, pp. 2–9.

*Aporia crataegi* has appeared in great numbers in many districts of the Government. Only about 55 per cent. of the pupae were healthy and produced butterflies. The remainder were suffering principally from a disease ("pebrin") which was also noticed on the caterpillars; about 7 per cent. of the pupae were infected by Tachinids and only 1 per cent. by other parasites. The most effective remedy is to destroy its winter nests, which can be best done when the trees lose their leaves.

Against *Anisoplia austriaca*, the driving of the insects to the edges of the fields by trailing ropes is suggested.

*Polyphylla fullo*, L., flies from the beginning to the middle of July and their larvae damage various plants on sandy soil, chiefly pine plantations and vines, devouring the roots. It is recommended to cover the earth in vineyards with straw, so as to prevent the insects from ovipositing on the earth. The beetles can be collected by hand, preferably during the morning; they also fly to light.

In one garden in Charkov and in some other places willows were attacked by the larvae of a sawfly, *Nematus salicis*, L. The trees were stripped of their leaves.

The author further reports on a special conference to consider remedial measures against *Phlyctaenodes sticticalis*, convened by the Executive of the Zemstvo Uprava, at which Messrs. Mokrzecki and Kurdjumov were also present. It was agreed that Paris green had not proved effective, while barium chloride was the most radical remedy; as to tobacco extract, while the results obtained were most satisfactory, its cost allows of its use only in the case of crops of high value. The conference also recommended digging trenches round fields; spraying the protecting zones on the edges of the fields with Paris green or azurgin; mowing forage crops threatened by the pest; and covering growing plants with earth, taking care that all caterpillars on these plants should be covered. Tanglefoot bands were also recommended for trees, using a composition prepared from one pound of castor oil and ½ lb. of resin boiled together, constantly stirring the mixture. To fight the insects in their pupal stage, deep ploughing, up to 7 inches, was suggested. It was reported that very few parasites had been noticed in the larvae or pupae. Rooks proved very useful and active in destroying the insects, while near human habitations the same work was done by sparrows.

It has been proved that although devouring all sorts of plants, the caterpillars prefer goosefoot, and straggling beets at a distance from the cultivated plants. In some localities they attacked potatoes and other Solanaceae, also wheat, oats, &c.

Averin (V.G.). Текущія работы въ августѣ [Operations to be undertaken in August].—Bull. no. 5, 7th August 1913, pp. 6–9.

From the district of Bogoduchov the station received some pests which injured various vegetables, devouring their roots. These proved to be the larvae of *Tipula* sp. (*oleracea*?), but the exact species could not be established, as all the larvae were infected by Tachinids and none pupated.

In the middle of July poplar trees in the town of Charkov showed a strange colour on their leaves, the latter being covered with whitish spots. It appeared that these spots were caused by caterpillars of *Lithocoletis populifoliella*, Fr., which ate away the parenchyma of the leaves leaving the upper and lower skins untouched. The foliage of some trees was quite dried up. The moths began to emerge on the 21st July.

The flight of the second generation of *Phlyctaenodes sticticalis* began on the 15th July and by 21st July had reached enormous proportions. The damage already done by the first generation was very great, although some districts of the Government, Valkov, Zmievsk, Izium and Kupian, did not seriously suffer, in other districts, Achtyr, Sunsk and Bogoduchov, the larvae destroyed many acres of cultivated plants. Judging by the number of moths, still greater damage might have been expected from the caterpillars of the second generation, but the moths of this generation were practically infertile and few or no caterpillars were observed. This is explained as being due to the rainy weather and low temperature prevailing in the second half of July, which did not allow the normal development of the pupae, thus affecting the reproductive organs of the females. The dissection of some hundreds of females proved that the ovaries were of small size and contained microscopically small eggs, which were not properly formed; the ovaries were also found to to be enveloped in fat.

The author deduces that there is no reason to expect large numbers of these insects in the coming year and no danger need be expected in the near future. While no doubt some females oviposited normally and produced descendants, their number must have been too small to be of practical importance.

Averin (V.G.). Зерновая совка; Кукурузный мотылекъ [*Trachea (Hadena) basilinea*, Schiff: *Pyrausta nubilalis*, Hb.].—Bull. no. 6, 7th September 1913, pp. 7–8, 11–12.

There were complaints from many localities that the caterpillars of *Trachea basilinea* were damaging wheat in the fields, as well as in sheaf. The following remedies are recommended: —Shake the cut grain before binding into sheaves; the sheaves must not be put in stook on the same field, but on a specially cleaned spot, round which trenches with vertical walls are dug; after threshing, the grain must be effectively winnowed, or, in case of a large number of caterpillars, thoroughly screened

through a sieve, the mesh of which should be fine enough to arrest the caterpillars. If necessary the sheaves may be disinfected by carbon bisulphide in the following way; a hole of suitable size is dug, preferably in loamy soil which does not let the vapours through, which is then lined and also covered with boards, tarpaulin and earth; in such a hole the sheaves are placed, together with vessels containing the insecticide, after which the hole is opened, the air in it well fanned and the wheat removed, when a new heap of sheaves may be put in.

Complaints of injury by *Pyrausta nubilalis* began to reach the Bureau at the end of August. In some localities the number of caterpillars on each plant of maize was 15–20, in others this figure rose to 40–60. The only useful remedy is the destruction of the damaged stalks at the actual time of the pests' activity; but the ploughing of the stubbles, their destruction by fire, &c. may prevent the re-appearance of the insects. It is recommended not to sow millet on maize fields attacked the previous year by this insect.

Averin (V.G.). Осенніе работы по борьбѣ съ вредителями сада; вредители огородовъ [Autumn operations against orchard pests: pests of market-gardens].—Bull. no. 7, 8th October 1913, pp. 1–4.

Operations against *Cydia pomonella* must be directed to depriving the caterpillars of their wintering abodes. As they usually winter in holes in the trunks, especially near the ground and near the crown of the root, it is recommended to remove all old, cracked bark and to smear the trunk with lime and sulphate of iron (1 lb. of sulphate in 2·7 gals. of lime-water). The caterpillars winter also in cracks in fencing, garden benches, &c., all of which should have boiling water poured over them.

Dry leaves on trees must be collected in autumn and winter and burnt, as they carry the eggs of *Aporia crataegi*. In places where *Malacosoma neustria* were found earlier in the year, the ends of branches bearing rings of eggs must be cut away and burnt. The eggs of *Lymantria dispar* are laid at the foot of tree-trunks and can easily be recognised; they may be destroyed by smearing them over with a brush with kerosene and birch tar or naphtha waste.

Branches containing nests of *Euproctis chysorrhoea* must be cut away and burnt.

After the leaves have fallen, it is recommended to spray the trunks and branches of apple trees with 5 per cent. solution of sulphate of iron against *Hyponomeuta malinellus*.

Against *Psylla mali*, *P. piricola* and Coccids it is useful to smear the trunks and spray the branches with lime-water containing 3–5 per cent. of sulphate of iron.

For *Gryllotalpa vulgaris*, trap-holes are suggested three-quarters filled with horse-dung and covered with earth. They will attract the insects as wintering places, and by digging up the holes in frosty weather during the winter and spreading the dung, they will perish from cold.

It is expected that there will be large numbers of *Pieris rapae* next spring. Re-ploughing of market-gardens in autumn or early in spring to a depth of about 5 inches may be recommended. The same applies to *Barathra* (*Mamestra*) *brassicae*.

*Selandria bipunctata* is a pest of roses; the only remedy is to dig the earth underneath the bushes in autumn or spring, as it is there that the insects hibernate, pupating at a depth of about 2½–4 inches.

Averin (V.G.). О возможности появленія лугового мотылька въ 1914 году [On the possibility of the appearance of *Phlyctaenodes sticticalis*, L., in 1914].—Bull. no. 7, 8th October 1913, pp. 10–12.

Observations on *P. sticticalis* conducted at the Charkov Bureau showed that some of the caterpillars pupated and emerged in the same summer, the remaining pupae wintering in this stage. Some of the cocoons were opened and proved to contain live caterpillars which had not yet pupated. The same was also observed by Prof. Vassiliev at the station in Smeila. The above phenomenon has been called "diapausa" by Prof. V. P. Pospielov; it consists in a pause in the life of the insect, all life-processes stopping and the insect remaining unchanged during this period. If it be a caterpillar which has formed a cocoon, it remains inside the same without pupating; if it be an emerged female, the diapausa results in sterility, as the development of the ovaries is stopped. If the number of caterpillars in diapausa is great, there may be a fresh invasion of the insects in the next spring. They may pupate in the spring of the next year, emerging soon afterwards, and at the end of the following May a fresh brood of caterpillars would appear. It is impossible to ascertain the general percentage of caterpillars in this state, owing to the small amount of material at disposal, but 5–8 per cent. of the caterpillars were found not to have pupated.

Averin (V. G.) Мелкія извѣстія [Short notes].—Bull. no. 7, 8th October 1913, pp. 15–16.

Between the 18th and 23rd September complaints were received at the Bureau from a few districts as to *Eriocampa adumbrata*, Klug, having seriously injured cherry trees. From another district 37 caterpillars of *Acronycta tridens*, Schiff., were sent, with the statement that they were destroying the leaves of cherry and plum trees. A few days afterwards the author found in the box in which these insects had been placed 18 cocoons of small, and 19 of large parasites.

At the first Russian Congress of Economic Entomologists, which took place from the 20th to the 23rd August in Kiev, N. V. Kurdjumov read a paper on *Oscinis frit*. His observations have shown that this fly, considered up till now as one of the

serious pests of summer crops, is at least harmless. When the sowing takes place at a normal time of the season these flies do not touch the primary stalk, feeding only on the side-shoots. Thus the plant does not suffer and in no way differs from normal plants. The author is even inclined to consider the flies to be useful, as by the destruction of the suckers the nutritive substances concentrate in the primary stalk. Notwithstanding the large material on which the author bases his statements, he is still doubtful as to the accuracy of his deductions and will continue his researches.

Valch (B.). Текущія работы въ іюлѣ [Operations to be undertaken in July].—Bull. no. 4, 8th July 1913, pp. 4–5 and 11–12.

*Hylemia antiqua*, Mg., were reported as injuring onions in some parts of the Government. The insects fly from spring to late autumn, there being two generations. The remedies suggested in order to prevent the infestation of the plants by the spring generation are, late sowing of onions or late re-planting, in case of biannual cultivation; and against both generations, the spraying of the earth between the plants with lime-water to which some carbolic acid has been added. After the solution has dried there remains on the earth a coating of lime, which, with the smell of the carbolic acid, prevents the insects from ovipositing. The attacked plants ought to be removed and destroyed, together with the earth sticking to the roots, which may contain the larvae and cocoons of the pest.

*Pissodes notatus*, F., last year prevented the afforestation of the sands conducted by the Government, as well as by private persons. Large portions of young plantations, sometimes even the whole of them, perished from the attacks of the weevils. The author says that on some trunks, in cracks as thick as the finger and 7 inches long, as many as 28 cocoons could be found. The only real remedy is to remove and burn the attacked trees. The collection and destruction of the beetles is also recommended.

The author remarking on the method of fighting various pests by hand-picking, which is very prevalent in Russia, such as the collection in winter of the nests of *Aporia crataegi* or *Euproctis chrysorrhoea*, says that this proves very successful and even preferable to applying expensive insecticides. He suggests at the same time the utilisation of this method for fostering the natural enemies of insects. To this end he recommends that the pests collected should not be destroyed, at least the more fully developed caterpillars and pupae, but that they should be placed in boxes covered with fine wire-netting having a mesh which would arrest the pests, but permit the escape of parasites. Such boxes or insectaries when placed in those parts of orchards or market-gardens, which are most attacked by pests, will not require any attention, and the emerged parasites would have fresh victims near at hand. The boxes ought to be left undisturbed for a considerable time, as some parasites require a lengthy period for their development.

Valch (B.). Мелкія извѣстія [Short notes].—Bull. no. 6, 7th September 1913, pp. 14–15.

Caterpillars of *Phlyctaenodes palealis*, Schiff., have damaged carrots in some localities. They make a web round the umbels and afterwards proceed to devour the seeds. The only remedy is to cut away and burn the attacked umbels.

During July larvae of *Hylotoma rosarum*, F., appeared on roses in nearly all the gardens round Charkov. Throughout August they pupated, the cocoons being made just below the surface of the earth. This small depth allows of collection by raking them up together with fallen foliage, when they can be destroyed. About 50 per cent. of the caterpillars taken to the laboratory were infected by parasites.

The Director of the Zoological Garden of the Society of Acclimatisation passed on to the author some insects identified by him as *Nematus salicis*, L., second generation. These insects have attacked willows in the garden of the above-named society. The proportion amongst the sexes was one female to a few hundreds of males. The males perished 3-4 days after hatching out. The females oviposited on the same trees on which the former generation appeared, but the larvae on emergence soon perished from some epidemic disease. There were no larvae noticed on the trees in the beginning of September.

Valch (B.). Вредители капусты въ текущемъ году [Pests of Cabbages during the current year].—Bull. No. 6, 7th Sept., 1913, pp. 12–14.

Since the beginning of July there have been complaints of insects damaging cabbages, principally from the districts of Charkov and Smievsk. At the time of writing they were coming from all parts of the Government. This year proved very favourable to insects and at the end of July and beginning of August, 10 to 15 larvae of *Pieris rapae* were commonly found on one cabbage plant, and later in August the butterflies appeared in enormous quantities. From the end of July eggs of *P. brassicae* appeared on cabbage leaves and the caterpillars being larger and living in companies did great damage; by the end of August, when they started pupating, there was little left of the cabbages except the stalks and veins of the leaves. At the time of writing (the beginning of September) their pupae were to be found everywhere near cabbage gardens, 5 to 10 pupae being found together.

At the end of August caterpillars of various Noctuids appeared, amongst which the author was able to find the following species: *Barathra* (*Mamestra*) *brassicae*, L., *Polia oleracea*, L., *Plusia gamma*, L., *Scotogramma* (*Mamestra*) *trifolii*, Rott., *Acronycta rumicis*, L. and *Feltia* (*Agrotis*) *exclamationis*, L., Caterpillars of *Diacrisia lubricipeda*, L., were also to be seen frequently on cabbage leaves. *B. brassicae*, *P. oleracea* and *Plusia gamma*

proved the most serious pests. As to remedies, insecticides cannot be safely recommended, as the poison may remain in the leaves and prove dangerous to man. Besides hand-picking, for which gloves must be used, as the ejections of the caterpillars are irritating to the skin, it is also recommended to pour over the cabbages hot water at 50°-60° R. (142°-167° F.), after which the plants must be immediately shaken. The hot water will kill the caterpillars, even those hiding amongst the leaves.

Valch (B. S.). Массовое появленіе капустной совки въ волчанскомъ уѣздѣ [Outbreak of *Barathra brassicae* L., in the district of Voltchansk, Govt. of Charkov].—Bull. No. 6, 7th Sept., 1913, pp. 1–4.

During the first half of August *Barathra* (*Mamestra*) *brassicae* has appeared in great masses in the district of Voltchansk, damaging cabbage, sugar-beet, forage-beet, &c. In some parts the large leaves of beet were totally devoured, only the thick veins remaining, and a few young leaves in the heart of the plants. The larva pupates in the earth, at a depth of 3 to 4 inches: and on one plantation the author dug up, in a space of 49 square feet, 198 pupae and 46 caterpillars, of which latter 18 were suffering from a bacterial disease. One larva produced on that day a larva of a small Tachinid fly, which immediately pupated. Besides this, there were found in the same soil a number of parasites, which shows that the actual number of caterpillars of *B. brassicae* was larger than the fore-going figures indicate: 81 large intact puparia of Tachinids and 36 from which the flies had emerged; 18 small Tachinid puparia and 45 pupae of other parasites. At the time of writing these pupae had not yet produced any adults. The author calculates that these parasites accounted for at least 141 caterpillar-hosts, so that on calculation, the total number of caterpillars on 49 sq. ft. is brought up to nearly 400. On another plot he found 145 pupae, 28 caterpillars pupating, 18 puparia of large Tachinids, 10 of medium size, 8 of small, and 9 pupae of other parasites.

The favourable weather allowed the plants to recover; the exact amount of damage to the gross harvest and to the proportion of sugar in the beets will only be ascertained later. As to the remedies, the season only permits digging the soil between the beds, when the pupae will be either destroyed at once or exposed and so perish later. The pupae lying on the beds and near the roots will however remain and either winter or produce insects in the present autumn. In the former case the digging and re-ploughing of the ground will kill them, while in the second case the catching of the moths by lights or traps may prove more or less successful; while should the caterpillars appear later, insecticides, such as recommended against *Phlyctaenodes sticticalis*, can be applied.

Much reliance cannot be placed on the natural enemies of the pests, as only 15-36 per cent. of the caterpillars were infected by parasites, and 4-5 per cent. by bacterial disease.

Andres (A.). **Note sur un nouveau ravageur du Maïs.** [A new maize pest.]—*Bull. Soc. Entom. d'Egypte, Cairo*, pt. 1, Jan.-March 1913, pp. 20-22.

The pests of maize in Egypt are few and do comparatively little damage. Until recently the best known pests were the cotton-worm (*Prodenia litura*); 'ver du bersim' (*Agrotis ypsilon*); the small cotton-worm (*Laphygma exigua*), which can cause fairly extensive damage by destroying the young shoots; *Pyroderces gossypiella*;* and *Sesamia cretica*, which bores into the maize stems, causing the growth of the plant to be arrested, and killing the stem attacked. The larvae of the newly discovered pest, *Pyrausta nubilalis*, Hb., attack the maize in much the same way, except that they destroy the grain. It is not known yet whether the pest is widely enough spread in Egypt to do important damage. This Pyralid is known also in Europe, where it attacks not only maize, but also hops, millet and hemp.

Andres (A.). **Note préliminaire sur un ravageur du riz.** [Introductory note upon a rice pest.]—*Bull. Soc. Entom. d'Egypte, Cairo*, pt. 2, April-June 1913, pp. 40-42.

The author had an opportunity of visiting, in May 1912, the neighbourhood of Wekerness, where half the rice harvest had been destroyed by a pest. The cause of the damage proved to be the larva of a fly, *Ephydra macellaria*, Egger. It is found in large numbers on the attacked rice plants, creeping on the young shoots and on the roots of young plants. The pupa fixes itself to the stems or roots. The larvae do not seem to be able to devour the plant, but live on decomposing material, causing a noticeable arrest of growth. The best method to combat them is to flood the fields completely where the fly is prevalent: this kills both the larvae and pupae. It is always necessary to re-sow the rice, but by the time the second crop has appeared the pest will be negligible. A brief description of the larva and pupa is given.

Van Hall (C. J. J.). *Robusta* **and some Allied Coffee Species.**—*Agric. Bull. of the Federated Malay States, Kuala Lumpur*, i, no. 7, Feb. 1913, p. 256.

Among the enemies of Robusta coffee, the "bubuk" (*Xyleborus compactus*) is sometimes the cause of the loss of many branches; but it has always been noticed that after a strong attack it disappears without special measures having been taken. Apparently it is kept in check by its natural enemies, of which a small Hymenopteron (Chalcidid) seems to be the most important. Anguillulids (*Tylenchus acutocaudatus*) in some places render Robusta culture almost impossible. Happily this enemy is not very common, and is confined to special regions. In the last few

* [This is probably not a pest, but merely a rubbish-feeder.—Ed.]

years a Tineid caterpillar has made ravages in the blossoms and the clusters of young fruit. In the dry season, after blossoming, the plants have been much damaged by this pest.

Allen (W. J.). **Fumigation.**—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 2, Feb. 1913, pp. 153-169, 3 figs.

Owing to the great diversity of opinion which has existed as to the efficiency of spraying solutions in spraying against scale-insects, etc., and the necessity of repeating the operation so often, a large number of citrus-growers have substituted fumigation, with highly satisfactory results. As, however, there are still cases which have not been so successful, the present account is given of the exact method of procedure that must be followed, and the precautions that must be taken. One of the reasons for failure is the under-estimation of the size of the tree. In measuring the tree it is necessary to get the extreme height and width. This may be done by means of a pole marked out in feet. To estimate the size of a tent to cover a tree of given height and width, the Morrill method may be used; this method is described with the aid of a diagram. Another cause of failure is that fumigation is often done at the wrong time. It is best carried out in February and March for several reasons: firstly, the insect is newly hatched and tender and more liable to be killed by the fumes than when it is older; secondly, the tree is not yet in the critical state when fumigation would harm it. The critical stage is when the fruit is about an inch in diameter, which is the case in the late spring or early summer. The work should be done at night, as then there is less danger of harming the tree than during the day. Lemon and mandarin trees stand fumigation better than orange trees; it is recommended only to treat the latter at night or on cool, dull days. The tents must be quite free from holes. Another precaution that must be taken is in weighing out the cyanide, and measuring the sulphuric acid and water, to see that they are in the right proportions and that there is a perfect solution of the whole of the cyanide; lastly, the boiling over of the generator is a source of failure. The method of procedure is as follows:—The water is first poured into the basin or generator, then the sulphuric acid added, and the generator placed well under the tree and away from the tent, so that when the cyanide is dropped in there will be no danger of splashing the tent. When the tent or sheet is over the tree and the sides, with the exception of one place, are held down by earth, the vessel containing the water and sulphuric acid is put under the tree, and then by inserting the arm through the loose part of the tent, the cyanide is dropped in. It is essential that the cyanide be added immediately after the acid and water have been mixed. The arm is withdrawn and the tent made close, the loose part being held down with earth. The tree should remain covered for 45 minutes. Tables are given showing the quantities of cyanide, acid and water required for trees of given size. There are also instructions, with diagrams,

to show how the tent may be made. As regards cost, an example is given, in which 275 trees of various sizes were fumigated, 715½ oz. of cyanide being used, and a corresponding quantity of sulphuric acid; the work occupied two days with three men; the total cost was £5 3*s*.

Froggatt (W. W.). **Cicadas as Pests** (*Melampsalta incepta*, Walk.).—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 4, April 1913, pp. 341-344, 3 figs.

The cicadas appear early in November in the neighbourhood of Sydney, where they are only too well known by their incessant screeching. No damage to trees, etc., however, was attributed to them, except that caused by the female when she lays her eggs, slitting open the bark to expose the sapwood. In 1912 the cicadas seemed to be starting out in a new rôle as insects damaging fruit trees. Early in November it was reported that several orchards in the Penrith district had been infested with a small black cicada in such swarms that many peach trees were completely covered; and by puncturing the bark of the trunk and branches, the insects had caused the trees to gum all over, thus doing serious damage. Specimens captured proved on examination to be the common wattle cicada, *Melampsalta incepta*, Walker. In October several specimens of "black flies" were forwarded from Dapto on the South Coast, which were said to be swarming over fruit trees in that neighbourhood. No damage was done although the insect was of the same species. Cicadas also attacked gum trees in the Richmond River district, puncturing the bark and letting out the sap.

Allen (W. J.). **Spraying.**—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 5, May 1913, pp. 431-436.

This is a paper dealing with the practical details of spraying methods in New South Wales. The whole is summarised in a very complete table, which gives the plant, the insects attacking it, the spray to use, when to spray and general remarks.

**Feeding Bees in Winter.**—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 8, Aug. 1913, p. 710.

In reply to a question from a correspondent as to whether it is advisable to feed bees during the winter, it is stated that bees should not be continuously fed during the winter, but put into winter quarters with enough stores to last until the spring. A mixture of 3 parts of honey to 1 of water should be made and fed to the bees while warm. If available some sort of inside feeder should be used, preferably the Miller or Alexander. If food has to be placed in the open it should be liquid enough to allow the bees to swim in it, and it must have plenty of dry floating material on its surface.

Noel (P.). **Les ennemis des laitues, des citrouilles, du laurier, des navets et des panais.** [Insect pests of lettuce, vegetable marrows, laurels, turnips, and parsnips.] — *Bull. Lab. Régional d'Entom. Agric., Rouen*, pt. 4, 1913, pp. 4-6, 10-11, 13-16.

The author gives the following lists of the insect pests of the above plants in France, with a brief indication of the damage done.

*Insect Enemies of Lettuces.*

Coleoptera: *Rhizotrogus aestivalis*, Oliv., *R. solstitialis*, Latr., *Melolontha melolontha*, L.; all root-feeders.

Orthoptera: *Gryllotalpa vulgaris*, L., eats roots and uproots seedlings.

Rhynchota: *Aphis papaveris*, F., *A. lactucae*, Schrank, *A. sonchi*, L., *Tychea setariae*, Pass., *Pemphigus lactucarius*, Pass., *Trioza flavipennis*, Först., *Eurydema oleracea*, L.

Lepidoptera: *Arctia caja*, L., *A. villica*, L., *Eucharia festiva*, Hüfn., *Diacrisia mendica*, L., *Pericallia matronula*, Hb., *Callimorpha hera*, L., *Cucullia lucifuga*, Schiff., *C. lactucae*, Schiff., *Feltia exclamationis*, L., *Mania maura*, L., *Agrotis plecta*, L., *Episilia festiva*, Schiff., *Euxoa segetum*, Schiff., *Agrotis pronuba*, L., *A. orbona*, Hüfn., *Plusia gamma*, L., *Barathra brassicae*, L., *Scotogramma trifolii*, Rott., *Polia persicariae*, L., *P. suasa*, Schiff., *P. oleracea*, L., *P. advena*, Schiff., *P. dysodea*, Schiff., *Xylina exoleta*, L., *Antitype chi*, L., *Haemerosia renalis*, Hb., *Euplexia lucipara*, L., *Zanclognatha tarsicrinalis*, Kn., *Z. tarsiplumalis*, Hb., *Gnophos pullata*, Tr., *G. obscuraria*, Hb., *Eucosma conterminana*, F.R., *Plutella maculipennis*, Curt.

Diptera: *Urellia amoena*, Frfld., *Chortophila gnava*, Mg.

Acari: *Eriophyes lactucae*, Can.

*Insect Enemies of Vegetable Marrow.*

Coleoptera: *Lagria hirta*, L., *Epilachna chrysomelina*, F.

Lepidoptera: *Phtheochroa rugosana*, Hb., *Tortrix podana*, Sc.

Diptera: *Orellia wiedemanni*, Mg., *Agromyza bryoniae*, sp. n., *Dasyneura bryoniae*, Bouché.

*Insect Enemies of Turnips.*

Coleoptera: *Ceuthorrhynchus sulcicollis*, Payk., *Baris chloris*, F., *Entomoscelis adonidis*, Pall., *Psylliodes chrysocephala*, L.

Rhynchota: *Trioza nigricornis*.

Lepidoptera: *Pieris napi*, L.

*Insect Enemies of Parsnips.*

Coleoptera: *Phytoecia ephippium*, F.

Rhynchota: *Aphis capreae*, F., *Capsus pastinaceae*, Fall.

Lepidoptera: *Loxopera dilucidana*, Steph., *Depressaria hofmanni*, Stt., *D. depressella*, F., *D. nervosa*, Hw., *D. heracleana*, de G., *D. badiella*, Hb., *Epermenia choerophyllella*, Stt.

DIPTERA: *Acidia heraclei*, L., *Schizomyia pimpinellae*, F. Löw, *Contarinia pastinaceae*, Rübs., *Macrolabis corrugans*, F. Löw.

CAMERON (A. E.). **General Survey of the Insect Fauna of the Soil within a limited area near Manchester. A consideration of the Relationships between Soil Insects and the Physical Conditions of their Habitat.**—*Jl. Econ. Biol., Birmingham*, viii, pt. 3, Sept. 1913, pp. 159-204, 3 figs., 2 pls.

The first part of this paper deals with the insect fauna of the soil at the grounds of the experimental laboratory at Fallowfield, near Manchester, with a general description of the locality, the methods used for collecting insects for examination, and the flora of the grounds. A list is given of 32 plants which are the hosts of insects or their larvae, and with each plant is mentioned the name of the particular insect infesting it; the list is followed by a more detailed description of the insects. Some 163 insects are mentioned. In the experiments, it was noted what parasites prey upon particular insects, and a list of parasitic Hymenoptera is given, containing 18 species referable to 5 families.

The second part of the paper deals with the varying conditions of soils and their effects upon soil insects. The question of moisture is first dealt with. Water is present in the soil in three conditions: gravitational, capillary and hygroscopic. Of these three, gravitational water is the most abundant, and the most destructive of insect life within the soil. Artificial flooding of areas is resorted to in checking soil pests, but it cannot be said to be a universal remedy. The author kept specimens of the larvae of *Agriotes lineatus* in water for six days, without their being killed: but those kept in water for eight days did not survive. The presence of capillary moisture is the most favourable to soil insects; when it is absent, for example after digging or hoeing in a dry season, insects either die, or penetrate lower down in the soil below the root zone. The relation of temperature to the condition of the soil is discussed, and it is pointed out that varying conditions of weather have an important bearing on various insect pests, and the author is of the opinion that definite meteorological observations, carried out in association with entomological work, would solve many questions relating to sudden outbreaks of pests, such as "leather-jackets" (*Tipula*) and wireworms (ELATERIDAE). Soil ventilation and its bearing upon insect life is dealt with; mention is made of the drainage which is indirectly caused by pests such as wireworms or leather-jackets boring into the soil and thus leaving an exposed surface to the air, which robs it of its moisture. It is said that in some cases the application of artificial manures, such as lime, is advantageous in increasing the permeability of a heavy soil, and lime, used as a fertiliser, renders the soil unsuitable to insect pests. A bibliography of works consulted is given.

Malloch (J. R.). **A Revision of the Species in *Agromyza*, Fallen, and *Cerodontha*, Rondani (Diptera).**—*Ann. Entom. Soc. America, Columbus*, vi, no. 3, Sept. 1913, pp. 269-335, 4 pl.

This is a review of the classification and nomenclature of the flies of the genera *Agromyza*, Fallen, and *Cerodontha*, Rondani, many of which are pests of crops. The revision is made in consequence of the confusion that has arisen in the case of the same or synonymous names being applied to different insects in America and Europe.

Krausse (A.). *Camponotus herculeanus vagus*, **Scop., als Korkschädling.** [*Camponotus herculeanus vagus* damaging cork.] —*Archiv. für Naturgeschichte, Berlin*, lxxix, pt. 6, 1913, pp. 34-35, 2 pl.

*Camponotus herculeanus* is one of the largest of Sardinian ants. It builds its nest in old dead trees, as well as in living ones. Very frequently it settles in the bark of the cork tree, usually in trees about 18 inches in diameter, and eats into the more valuable new layers of the cork; in this respect differing from *Cremastogaster scutellaris*, which eats only into the, technically speaking, valueless layers of cork. Inside the cork it hollows out large chambers and passages, making the cork quite useless.

Schneider-Orelli (O.). **Ueber wurmistichige Flaschenkorke.** [On worm-bored bottle corks.]—*Schweiz. Zeits. für Obst- und Wein-bau*, xxii, no. 22, 24th Oct. 1913, pp. 305-307.

Damage is frequently caused by insects laying their eggs in the corks of bottles; the eggs hatch, and the maggots eat into the cork, often causing the wine to escape or allowing an inlet to moulds which destroy the wine. The matter has been dealt with by Feytaud in the "Revue de Viticulture" (Vol. xxxiii, p. 113). That the eggs are not already in the corks when they are put into bottles is certain, as the corks are boiled for 30-40 minutes to increase their elasticity. The author examined the maggot which infested the corks of bottles containing, for the sake of experiment, sterilised grape- and fruit-juice. The corks themselves had an incrustation, and in many cases they were tunnelled through, allowing the wine to escape. At the peripheral parts of the cork there were irregular, branched tunnels, out of which came small yellowish-white moths, about 10 mm. in length. These were identified as the corn moth (*Tinea granella*, L.) that causes considerable damage in granaries. In other corks a beetle, *Corticaria crenulata*, Gyll., was found.

To prevent the entry of the moth, nothing is better than a metal covering to the cork; lacquer is also useful, provided it

does not crack: in some cases a layer of paraffin wax may be used. Sulphur fumigations are useful in killing the moth and in preventing the spread of the damage.

Woodhouse (E. J.) & Dutt (H. L.). **Further work against surface caterpillars at Mokameh in 1912.**—*Agric. Journ. of India, Calcutta*, viii, pt. 4, Oct. 1913, 18 pp., 1 pl., 2 maps.

An account is given of a campaign in which the Andres-Maire moth-traps were used on a large scale to check the damage caused annually by *Agrotis* on ten-thousand acres of the Mokameh tal. The Andres-Maire trap, imported from Egypt, is constructed to attract moths by sugary solutions into a cage from which they cannot escape. The traps are raised some four feet off the ground in order to increase the distance to which the scent of the attractive liquid is carried. So far as they affect the question, the life habits of the insect (*Agrotis ypsilon*) are given. The pest is active during the cold weather in the Gangetic plain, and as nothing is known of its whereabouts during the hot weather, it is supposed that it aestivates in the Himalayas. The moth is a strong flyer, not usually attracted by light, and lives some time as an adult. It lays its eggs chiefly in newly-ploughed or irrigated soil. The caterpillar lies hidden in cracks in the soil by day and feeds at night by cutting off the stems of young plants. The extent of the damage caused by the caterpillar depends on the fact that it is not content with making a meal off the first plant it cuts down, but moves about, cutting off a large number of leaves in the course of a night. In spring the life-history takes about six weeks, but there is evidence to show that this is reduced to a month in the autumn. The female lays about 300 eggs. It is claimed that the traps have been completely successful in checking the pest. In the year under review less than one hundred acres were damaged by *Agrotis*, while more than sufficient insects were killed than would account for the damage that would have been caused on the remainder of the area, to judge from the experience of previous years. The traps appear to be more efficient at Mokameh than in Egypt, because they attract all the *Agrotis* moths within a very wide radius; they attract gravid females as well as males. In view of the egg-laying habits of the female, great stress is laid on the importance of getting the traps on to the low lands while these are still wet, as previous experience showed that the moths lay their eggs on these lands while they are still muddy. The number of moths that escape from the traps is small and probably 1 in 200, but the resulting caterpillars are usually found near the traps and can therefore be more easily found and destroyed. It is claimed that a crop worth over £20,000 has been saved by the investment of £255 in preventive measures.

One table gives the number of males and females caught, the weather conditions, &c., from March to December, 1912. A second table contains a statement of the caterpillar attacks in different fields, at different distances from the traps. A third

gives the proportion of males and females caught. It shows that the proportion of females was 56·5 per cent., 52·1 per cent., and 38·4 per cent. for the months of December, November, and September. Another table shows the distances apart of the traps, which varied from 410 yards to 2,800 yards. There is also a map of the district showing the positions of the traps.

Misra (C. S.). **The Red Spider on Jute** (*Tetranychus bioculatus*, **Wood-Mason**).—*Agric. Journ. of India, Calcutta*, viii, pt. 4, Oct. 1913, pp. 309-316, 1 pl.

The discoloration of the jute leaves frequently observed in the fields and in experimental plots is due to a phytophagous mite called the Red Spider, or Spinning Mite (*Tetranychus bioculatus*). It repeatedly punctures the leaves of the plant, sucking some of the sap; more damage is done by the sap which runs to waste than by the loss of that which the mite actually uses for food. The waste sap decomposes and forms a stoppage in the sap channels which nourish the rest of the leaf. The infested leaves turn a deep coppery green colour, curling over and becoming very crisp. This Red Spider is also found on cotton, castor, mulberry, orange, indigo, *Triumfetta neglecta*, *Urena lobata*, *Hibiscus ficulneus*, *H. penduriformis*, and *H. abelmoscus*.

It has been under observation since 1909, when it was noticed on the jute for the first time. In May-June 1910, it attacked castor. Last year the spider was found to hibernate in the adult stage on the lower surface of castor leaves. The adults remain inactive until February, after which they copulate and lay eggs. They increase extremely during April, May and June. The adults lay eggs the day after reaching maturity. Each female lays from 80-90 eggs, the larva emerging within 4-5 days after the eggs are laid. On hatching, the larva begins to feed, and spins a web all round itself. A few days later it undergoes metamorphosis and emerges as an adult, the whole life-history occupying only 8-9 days. Starting from a fertilised female on the 1st March, there will be 3,500,000 spiders ready to reproduce at the end of the month, provided the weather conditions are suitable. Thus it is evident that if measures are to be taken to combat the pest, they should be taken early to prevent this enormous increase.

There are five known parasites upon the mite: a small ladybird beetle (*Clanis soror*, Ws.), a small black Staphylinid beetle, a small Coccinellid or Corylophid beetle, a species of *Scymnus*, and *Brumus suturalis*, F.

Rain is fatal to the Red Spider; a shower has frequently been observed to wash away and kill numbers of them from infested trees. From this it follows that plants sprayed with sufficient cold water would be freed from the pest. In nurseries and with plants in pots, much good is done by fumigating the affected parts with burning sulphur. But this is impossible in the open, and in this case a good remedy is either dusting the plants with flowers of sulphur, or spraying them with a mixture of flowers of sulphur and crude oil emulsion. Roll sulphur, no matter how

finely powdered, must not be used, as it invariably clogs the nozzles of the spraying machine. The following formula is given:—crude oil emulsion, ½ pint; flowers of sulphur, 2 ozs.; water, 4 gals. The sulphur should be thoroughly mixed with the emulsion. High pressure sprays should, if possible, be used, in order to penetrate the webs inside which the nymphs are protected. If there still remain mites after the first spraying, the process should be repeated with twice the quantity of sulphur.

The paper concludes with a table giving the size of the plot treated, the formula for the spray, the machine used, the time taken, and the labour and cost. Five plots of $\frac{1}{30}$ acre each were sprayed with liquid prepared as given above, with a Gould's Standard Spray Pump, mounted on a cart. The time taken was two hours, and the total cost for four men and material for spray liquid was 2*s.* 6*d.*

Coventry (B.). **Report of the Director.**—*Report of the Agric. Research Inst. & Coll., Pusa,* 1911-1912, *Calcutta,* 1913, pp. 9-10.

Reporting upon the entomological work done during 1911-1912, the Director says that a campaign has been carried out against the Deccan Grasshopper. The method known as "bagging" was adopted more or less successfully, and the infested lands were ploughed up. A leaflet was issued describing the methods to be adopted against this pest. Experiments against termites were continued in the Central Provinces; the application of kerosene oil was found most effective in dealing with the mound-building species. The collection and despatch to the Punjab of parasites of the cotton boll-worm formed an important part of the work of the Institute, as dependence is placed upon this parasite in order to keep down the pest. In the United Provinces measures were adopted against the Rice Grasshopper, which has become a serious pest of sugar-cane in that region. The method of storing seed potatoes in sand as a protection against the Potato Moth was successfully demonstrated to cultivators in Bengal. At Mokameh a campaign was organised against *Agrotis ypsilon,* which had been destroying crops. Hand-picking of the first brood of caterpillars and the setting up of the Andres-Maire traps reduced the damage to such an extent that out of a total area of 20,000 only 2,000 bigahs were affected. Experiments are being conducted in breeding hybrids between the Indian multivoltine variety of mulberry silk-worm and univoltine races from Europe. If this work is successful, it is said that it will go a long way towards placing the Indian silk industry on a more stable footing.

Headlee (T. J.). **A Brood Study of the Codling Moth.**—*Journ. Econ. Entom., Concord,* vi, no. 5, Oct. 1913, pp. 389-395, 4 figs.

No point of the life-history of the codling moth (*Cydia* (*Carpocapsa*) *pomonella*) is more important, from the standpoint of control, than the number and succession of broods; for these

factors determine the periods during which fruit and foliage must be kept covered with a poisonous coating. According to all accounts there are two broods; the object of the present experiments were to demonstrate the presence or absence of a third brood. The results of the experiments are represented by curves. Three separate and distinct emergences of adult moths are shewn; three definite egg-laying periods are indicated, also three distinct pupation periods; while only two distinct larval emergences are represented. Thus it appears that in 1912, in the course of the out-door tree-cage studies at Manhattan, three distinct and successive appearances of each of the moth's stages, except the larval, were determined. The third emergence of the larva would come during September and October. The fact that only 48 per cent. of the larvae of the second brood pupated shows that the third brood is only partial. The conclusion therefore is that there are two complete broods and a third partial brood.

Davidson (W. M.). **On the pupal instar of the Fruit-tree Leaf-roller (*Archips argyrospila*, Walker).**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 396-398.

During the summer of 1911 the author found occasion to study the pupal instar of the Fruit-tree Leaf-roller at San José, California. He found that the maximum pupation took place about 20th May. Live pupae were found as early as 24th April and as late as 1st July. The average pupal period was 19·9 days. From the results obtained by Gillette and Weldon, it appears that the whole process occurs about a month earlier in California than in Colorado, and that the pupal instar occupies almost double the number of days in the former state. A comparison of the climatic conditions in the two states might throw light on the question.

Severin (H. H. P.). **The Life-History of the Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.), with a list of the Fruits Attacked.**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 399-403, 2 pl.

This paper gives an account of the life-history of the Mediterranean fruit fly, as worked out upon the tropical almond (*Terminalia cattapa*) in Hawaii. In ovipositing the fly forms a small receptacle in the fruit with the proboscis into which the eggs are laid, being then covered with a gelatinous secretion by the fly. In some unripe fruits this secretion prevents further growth of tissue in this region, and results in the formation of a depression on the surface of the fruit. The number of eggs deposited within a receptacle varies from 1-42. It often happens that the fly is unable to withdraw its ovipositor from the fruit, and dies in this position. Eggs laid in the ripe tropical almond hatch in 2-3 days, but the period is prolonged when they are laid in green fruits. The larvae work their way into the pulp of the fruit, which soon begins to decay and drops to the ground. The larval period lasts from 8-17 days, and then the maggots bore out and

enter the ground to pupate. The total number of maggots found in 25 infested almonds gathered at random was 1,380. The largest number of adult flies bred from a single almond was 60 (28 males and 32 females). The maggots rarely pupate within the fruit. The pupal period lasts from 15-17 days, and the flies are not mature for 11-14 days after they emerge.

A list is compiled of the trees which are subject to attacks by this fruit fly. It contains 38 names including most of the important fruit trees in the Hawaiian Islands. The following, however, are said to be immune:—Breadfruit (*Artocarpus incisa*), rough-skin lemon (*Citrus medica*, var.), "noni" (*Morinda citrifolia*), mulberry (*Morus nigra*), pomegranate (*Punica granatum*), and tamarind (*Tamarindus indica*).

Ewing (H. E.). **Notes on Oregon Coccinellidae.**—*Journ. Econ. Entom., Concord,* vi, no. 5, Oct. 1913, pp. 404-407.

This is an account of the Coccinellidae of Oregon made from field notes and laboratory records taken by the author during the past two years. Various laboratory experiments were made to test their fecundity, the stability of varieties, and the economic value of different forms. The most abundant species found in Oregon is *Hippodamia convergens*, Guér., followed by *H. spuria*, Lec. Next in numbers, though probably not in importance, is *Coccinella novemnotata*, Hbst. Then come *Chilocorus bivulnerus*, Muls., and *Cycloneda sanguinea*, L., which if not so abundant as *C. novemnotata*, attack more serious pests. *Psyllobora taedata*, Lec., is abundant among the foothills and mountains in summer, but is of no special economic value. *Smilia misella*, Lec., does good work in the Willamette Valley against the San José scale. *Adalia bipunctata*, L., *Hippodamia parenthesis*, Say, and *Coccinella transversoguttata*, Fald., are present in large numbers, but are never of economic importance.

Late in July or early in August many of the common Coccinellids run short of aphid food, and for a while are found in great numbers feeding upon the pollen of various plants. By the middle of August a definite migration commences; they leave the hot, dry valleys and move upward, many of them never stopping until the highest point is reached, and there they hibernate. Thousands were found in September on the summit of Mount Chintimini, the highest point in the Coast Range mountains. A list is given showing the dates of emergence of the first of each species, taken at Corvallis, 230 miles above sea level, in 1913. A *Chilocorus bivulnerus* emerged on 10th Feb.; other species emerged during April up till the 21st. By the time they reach the valleys abundance of food is ready for them, as the aphids usually hatch in March, and are mature by the middle of April. This food supply is cut short by the middle of May, by the voracious appetites of the Coccinellids aided by other enemies, notably the Syrphid fly larvae and a Lampyrid beetle (*Podabrus pruinosus*, Lec.).

There is a preference shown by most Coccinellids for certain species of Aphididae. Among the most sought are:—The Black

Cherry Aphis (*Myzus cerasi*, F.), Snowball Aphis (*Aphis viburni*, Scop.), Rosy Apple Aphis (*Aphis sorbi*, Kalt.), and European Grain Aphis (*Aphis avenae*, F.). On the other hand such aphids as the Green Apple Aphis (*Aphis pomi*, de G.) and the Woolly Apple Aphis (*Eriosoma lanigera*, Haus.) are not nearly so much relished.

Watson (J. R.). **An Unusual Type of Injury due to a Thrips.**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 413-414, 1 pl.

The author has observed an unusual type of injury to camphor trees in Florida due to *Cryptothrips floridensis*, Watson. In the beginning of the infestation, the eggs are laid between the scales of the terminal bud. If the bud has commenced to develop when the eggs hatch, the larvae first attack the new growth. If there are but few larvae on each bud, there will result a blackening and deforming of one side of the young leaves. If there are many larvae on the bud, the bud will be killed outright. The insects then attack the younger twigs, where they feed in groups. The bark where these groups feed is killed, and as it dries, it cracks. The adults use these cracks as means of entrance to the cambium, where they lay their eggs. As the infestation proceeds, the bark on all the twigs is killed and the leaves are shed. This leaves the cambium as the only suitable breeding place, and here the larvae, as well as the adults, are to be found. The work on the cambium is continued until the whole plant is killed. The insect seems to be incapable of flight, although it has well-developed wings. It is probably spread from plant to plant by means of workmen and horses, and by crawling over the ground. It was found on large trees at Satsuma, near Palatka, and at Tampa, but it seems to do very little harm to these. It is the younger seedlings in the nursery, and the young trees in the field that are killed. It is a question whether this insect is a native species which has spread to the camphor, or whether it was imported with the camphor, which is not a native plant of Florida.

Tobacco decoction kills the pest, but it must be made stronger than for most species. For the adults, the liquid now in use is made up of half a gallon of whale oil soap; half a gallon of commercial lime-sulphur; and half a pound of Black Leaf 40, to 50 gallons of water. This has proved efficient, though it does not kill the eggs, nor the adults and larvae hidden under the bark. By spraying not later than the stage when the larvae are mostly in the buds or on the outside of the twigs, and by cutting out the trees in the later stages of infestation, it was found possible to control this pest.

**A Destructive Root Mite.**—*Agric. Gaz., N.S. Wales, Sydney*, xxiv, no. 1, Jan. 1913, p. 71.

In an editorial note reference is made to a report in the *South Australian Journal of Agriculture* that at Mount Barker the "bulb mite," *Rhizoglyphus echinopus*, has been found in large

numbers upon French beans. This small semi-transparent mite, attacks stored onions and bulbs, carrots, fruit trees, and various roots and seedlings. The attacked surface appears to be covered with a greasy dust. When once attacked, the plant is nearly always doomed. In apple roots the bark softens and readily tears off, when swarms of mites are seen. Sulphur will prevent the mites attacking stored bulbs and cuttings, but once they have gained access to the roots, nothing economically practicable can be done against them.

**Excessive Spraying with Red Oil Emulsion.** — *Agric. Gaz., N.S. Wales, Sydney,* xxiv, no. 2, Feb. 1913, p. 151.

In an editorial note, a report is given upon the cause of death of apple trees in a carefully tended orchard. The trees had been sprayed with Red Oil against the Woolly Aphis (*Eriosoma lanigera*), and death was probably due to excessive spraying. On unearthing the bole of the tree it was found that the bark of the most seriously affected trees had been entirely destroyed. It appears that the red oil emulsion had run down the stem of the tree, soaked into the ground, and as the water evaporated, the concentrated oil had destroyed the bark at the foot of the tree. It is possible that the spray in the barrel had not been kept thoroughly emulsified during the spraying, in which case the first trees sprayed would get a very weak solution and the last a very strong one.

Froggatt (W. W.). **White Ants in Orchards.** — *Agric. Gaz., N.S. Wales, Sydney,* xxiv, no. 8, Aug. 1913, p. 728.

White ants are difficult to deal with in an orchard, as poisons that will kill them kill the plant also. When planting, care should be taken that all damaged roots are cut away. Deep planting is a mistake, if the scar of the graft is brought underground, as the scar is a likely place for the attack of termites. All stumps and dead wood should be removed from an orchard, as they tend to harbour the pest. Where the ground is well worked round the trees, white ants seldom do any damage. When they are found about the roots of a fruit-tree a few pounds of kainit dug in will drive them away, and also act as a manure.

**Cut-Worms.**—*Journ. of the Dept. of Agric. of Victoria, Melbourne,* xi, pt. 9, Sept. 1913, pp. 533-534.

*Agrotis* and other allied caterpillars, have proved by far the worst scourge with which Victorian vine-growers have had to contend. Where active steps have not been taken to combat them, complete failure of an otherwise faultless plantation has several times occurred. The methods detailed in the *Journal* for July 1911, have proved satisfactory, especially the use of arsenical bait. A new method of control described in *Le Progrès Agricole*

of 20th July 1913, has proved very satisfactory in the south of France. This method comprises two distinct phases, (1) the attraction of the caterpillars by means of vegetable baits; and (2) their ultimate destruction with a corrosive liquid. The first phase has been practised for some time. The bait recommended is a small patch of peas which should be sown near the vine and early enough to be up before the latter begins to grow. Cutworms will leave the vine for the peas. The second phase, the destruction of the worms by means of a liquid, is new. Various liquids were tried, many of which failed to wet the skin of the larvae. A 3 per cent. solution of commercial cresyline or creoline was finally adopted and proved entirely successful, the larvae being readily wetted by it. About a pint of this solution to a patch of peas is sufficient. It can be most conveniently applied with a spray pump with a worn nozzle, such as will produce a shower rather than a spray. Lest the creoline should damage the young vine, the peas should be planted at least two feet away from it. The cost of treatment is estimated at 2*s.* 8*d.* per acre, for pea-seed and labour, and 8*s.* an acre for destroying the grubs, *i.e.*, for solution and labour. This is based on 1,760 vines per acre.

French (C.), jun. **The Metallic Flea-Beetle (*Haltica pagana*); a New Strawberry Pest.**—*Jl. Agric. of Victoria, Melbourne*, xi. pt. 10, Oct. 1913, p. 591.

During the last few months, strawberry-growers in the Wandin and Evelyn districts have complained of losses through the depredations of insects, which are small in size, and of a purple metallic colour. They swarm in great numbers on the strawberry plants, making numerous small holes in the leaves and young flower buds, and causing them to wither. The trouble was found to be due to the Metallic Flea-beetle (*Haltica pagana*) a native insect which formerly fed on the leaves of the "Sheep Burrs" (*Acaena ovina* and *A. sanguisorbae*). As raspberries, apples, pears, etc., belong to the same natural order, growers should be on the watch for these insects. Arsenate of lead spray is an excellent remedy against the pest, but it should not be used whilst the plants are fruiting. A deterrent such as benzol emulsion could be used. Kerosene emulsion is also a useful spray. Numbers of these insects could be shaken off the plants into shallow tin dishes containing some sticky substance.

Quaintance (A. L.). **Remarks on Some of the Injurious Insects of Other Countries.**—*Proc. Entom. Soc., Washington*, xv, no. 2, June 1913, pp. 53-88.

The annual presidential address reported in this number is a survey of the injurious insects of numerous countries outside the United States, given under headings arranged according to the orders of insects. The subject is dealt with in a comprehensive manner, and with each insect is mentioned its methods of attack and its host plants.

Hood (J. D.). **Nine New Thysanoptera from the United States.**—*Proc. Biol. Soc., Washington*, xxvi, June 1913, pp. 161-166.

Nine new species of Thrips are described. One is of economic importance, viz., *Liothrips montanus*, sp. nov.; fourteen females and two males were taken on currant and gooseberry bushes at Bozeman, Montana.

Kleine (R.). **Die Kümmelmotte, *Schistodepressaria nervosa*, Hw.**—*Zeitsch. für Wissen. Insektenbiol., Berlin*, ix, nos. 5, 6, & 7, 1st July 1913, pp. 183-190, 2 figs.

This is an account of the biology and economic significance of the caraway-seed moth, *Schistodepressaria nervosa*, Hw. [see this *Review*, Ser. A, i, p. 159]. The insect hibernates as an imago in some umbelliferous plant, and in the spring it lays its eggs on the leaves of the caraway-seed plant. The caterpillar eats into the stem, inside which it pupates, thus impoverishing the blossom and preventing the formation of the seed.

The author says that the only method of attacking the pest is to destroy the moths at the end of the life-cycle, *i.e.*, before they hibernate. In carrying this out, use should be made of the fact that the emergence of the moth occurs a few days later than the time when the seed is ready to be gathered. The cutting should be at the earliest possible date, and the thrashing of the seed as soon after that as possible, and what remains of the plant after thrashing should be burned at once. A list of parasites of the insect are given. The most important are:—*Cryptus profligator*, Grav., *Ophion vulneratus*, Grav., *Microgaster* sp., *Eulimneria costalis*, Thoms., and *Litomastix truncatella*, Dalm.

Scherdlin (P.). **Einiges über den Apfelwurm (*Carpocapsa pomonella*).** [The apple worm, *Cydia pomonella*.]—*Internat. Entom. Zeits., Güben*, vii, no. 18, 2nd Aug. 1913, pp. 121-123.

This article deals with the morphology and life-history of the codling moth *Cydia (Carpocapsa) pomonella*, L., and the usual remedies are recommended.

Holloway (T. E.). **Some Methods of Handling Minute Hymenopterous Parasites.**—*Journ. Econ. Entom., Concord*, vi, no. 4, Aug. 1913, pp. 341-344.

This is an account of the methods used by the author in dealing with the hymenopterous egg-parasites *Trichogramma minutum (pretiosa)*, Riley, and *Telenomus* sp. (probably *heliothidis*, Ashm.). The easiest way of collecting these small insects is to breed them from the parasitised eggs. These eggs, separated from the plants on which they have been laid, should be put into glass tubes about 8 mm. wide by 24 mm. long, about

10-15 eggs in a tube. A piece of fine cotton-wool makes a good stopper. The larvae of the unparasitised eggs, which will be the first to emerge, should be removed from the tube. The parasites may be expected to emerge within a short time after the eggs turn black, and sometimes several adults of *Trichogramma* emerge from one egg. These may be fed by moistening the sides of the tube with a weak sugar solution; only a very small amount of the solution is necessary (not more than can be observed with the aid of a lens), and the solution must not be sticky. The host eggs are given about 24 hours after the males and females have emerged. When it is desired to have the parasites oviposit, they may be introduced into tubes (8 mm. by 24 mm.) in which a number of host eggs and a minute drop of the sugar solution have been placed. In transferring the parasites from one tube to another, it was found best to place the tubes on a smooth white surface so that the insects might easily be observed. A plate of glass, 5″ × 7″ with a piece of white paper glued to the underside, was used for this purpose. A few parasites were allowed to come out on the glass plate and they were then made to walk or jump into the proper tube, which was held open for them. If necessary, the parasites were touched very slightly with a camel's hair brush to make them go in the right direction. The males may be left out of account. It was found most convenient to place two or three females in a tube containing about 50 eggs. Use may be made of the fact that the parasites travel towards the light. The tubes should be kept in a suitable tray on a piece of white paper, so that the insects may be observed.

For shipment, the tubes containing parasitised eggs may be packed in card-board post boxes. Cotton-wool should be placed round the eggs to prevent them from shaking in the tube, and each tube should be packed in cotton in another larger tube. If cold storage is used, care should be taken not to subject the eggs suddenly to a much higher temperature; to avoid this the cases should be transferred from the cold room to thermos jars and conveyed in those jars to the laboratory, and they should be left thus for about 24 hours before unpacking.

Townsend (C. H. T.). **The Peruvian Fruit Fly** (*Anastrepha peruviana*, **n.sp.**).—*Journ. Econ. Entom., Concord*, vi, no. 4, Aug. 1913, pp. 345-346.

Wormy fruits have long been known in the Peruvian coast region. The injury seems most acute during February, at the time when peaches, guavas, cherimoyas and other fruits are ripening. The fly is a general fruit pest, attacking not only deciduous fruits but citrus fruits as well. Peach and guava trees are often so completely infested that it is often impossible to find a single sound fruit on the tree during February. The species is a new one, and is described under the name of *Anastrepha peruviana*. The author recommends as a remedy a spray modelled after the Mally fruit fly spray used in S. Africa, applied to the foliage before the fruits begin to ripen, or as

soon as the presence of the flies is noted. The formula most convenient for use in Peru is lead arsenate 5-10 lbs., chancaca (brown or black cane sugar in cakes) 25-50 lbs., and water 100 gallons. The chancaca is dissolved in boiling water before adding the arsenate solution. The amount of arsenate is varied according to the kind of foliage, guava and orange standing much more than peach; the sugar content should increase in the same proportion as the arsenate.

Severin (H. P.) & Severin (H. C.). **A historical account of the Use of Kerosene to Trap the Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.).**—*Journ Econ. Entom., Concord*, vi, no. 4, Aug. 1913, pp. 347-351, 1 fig.

This paper contains the result of experiments made to control the Mediterranean fruit fly (*Ceratitis capitata*, Wied.) by means of kerosene traps, followed by an historical account of this method as practised or recommended in other parts of the world. The attempt by the authors to check the fly by this means was a complete failure. They attribute this to the fact that the proportion of females to males caught was very small, only 1 in 200. Entomologists have strongly recommended the use of the kerosene trap in other parts of the world, notably in Australia, on the grounds that many flies are caught by such traps, but in most cases the proportion of females to males has been ignored.

Dew (J. A.). **Fall Army Worm (*Laphygma frugiperda*).**—*Journ. Econ. Entom., Concord*, vi, no. 4, Aug. 1913, pp. 361-366.

This paper sets out the information obtained during the outbreak in Alabama last year, by experiments conducted by the Alabama Experiment Station. A list is given of the observed food-plants of *L. frugiperda*, which includes most of the commonly cultivated crops; the only common plants upon which no larvae were seen feeding were Cucurbitaceae, such as, watermelon, squash, pumpkin, etc. The first appearance of adults recorded in Alabama was on 4th May 1912. On 15th May ravages by the larvae in the Mobile district and from other parts of South Alabama were reported. General pupation occurred from 20th May to 1st June. The life-cycle was completed again during the next thirty days and in July the infestation was very wide-spread. Two other generations were completed, one in August and one in September. Occasional larvae were found in October and November; specimens have been observed hibernating in the larval, pupal and adult stages, about 80 per cent. as pupae. The life-history is briefly as follows. The female lays her eggs in clusters of 60-500, upon the leaves of corn, cotton, etc., covering the mass with down composed of silken threads and scales from her body. The eggs hatch in 2-4 days and the larvae skeletonise the tenderest foliage that is to be found. There are four moults at intervals of 24, 36, and 40 hours, and 2½ days.

The larva pupates in the soil near the food-plant, and the adult emerges at the end of 3-16 days.

The predaceous enemies include notably the beetles, *Tetracha carolina* and *Calosoma calidium*, and the wasps, *Polistes canadensis* and *Pelopaeus cementarius*. The most important parasites are *Nemorea leucaniae* and *Sarcophaga georgina*. Birds also feed upon the larvae, especially the quail, field lark, crow, mocking bird and English sparrow.

Two methods of artificial control were found to be effective, mechanical and arsenical. Nearly a hundred experiments were conducted during the year with varying results. From these the following conclusions can be drawn:—a light shallow cultivation with either harrow or sweep, during the pupal period, will turn up from 10-50 per cent. of the pupae; ordinary summer heat at the surface of the ground (120° F.) will kill the pupae in 20-30 minutes; when the larvae assume the army habit of travel, rolling with a heavy roller is ineffective except on hard ground; a heavy log, dragged up and down in a furrow, in the path of the advance is effective; powdered arsenate of lead (1½ lbs. to 50 gals. of water) was effective when applied to plants upon which larvae were feeding; arsenite of zinc (1 lb. to 50 gals. of water) was also effective. When an "ortho" arsenate of lead was used, there was no injury to any of the food-plants. Acid or "meta" arsenates of lead caused burning in some cases, unless lime was added. Arsenical control was obtained in young corn only when the spray solution was forced into the bud. Dusting was not effective, except on plants having a broad lateral leaf surface, as cotton, cowpeas, etc. Poison bait was ineffective in the majority of cases. Early in the season, when the fields were clean of grass and weeds and the larvae spent the day in the soil, coming up at night to feed, poisoned bran-mash killed large numbers, when placed at the base of young corn or cotton plants: moths can be trapped at lights from dusk to 11 p.m., but about 50 per cent. of those captured will have already deposited eggs; while in tropical and sub-tropical latitudes larvae may be found all the year round, there is little doubt but that in the more northern States the species winters as a pupa. Autumn and early winter ploughing therefore, should greatly reduce the numbers of the hibernating pupae.

Forbes (R. H.). **The Gasoline Torch Treatment of Date Palm Scales.**—*Journ. Econ. Entom., Concord,* vi, no. 5, Oct. 1913, pp. 415-416.

Date palms imported from the Old World into Arizona have been generally infested with two scale-insects, *Parlatoria blanchardi* and *Phoenicoccus marlatti*, commonly known as the Parlatoria and Marlatt scales. Parlatoria infests the outer parts of the palms, including leaf-stalks, foliage and fruit. The Marlatt, on the other hand, is found deeply buried between the overlapping bases of leaf-stalks. The writer devised a method of getting rid of Parlatoria by drenching the plants with gasoline and setting fire to them. Since then it has been found that the

use of the gasoline blast torch is much more effective, and controls Parlatoria thoroughly and economically. The Marlatt scale, by reason of its deep-seated location in the date palm is not reached by a treatment which suffices for Parlatoria. By cutting the old leaf stubs down to the bole of the tree and then burning the exposed bole with the gasoline torch, even this scale may be entirely removed. The old Egyptian palms on the Experiment Station Farm near Phoenix, Arizona, thus pruned down to the boles and burned in 1906 are now entirely free from Parlatoria and Marlatt scales. Upon the basis of these observations the following treatment of infested date palms is recommended, and has been adopted by the Arizona Commission of Agriculture and Horticulture:—Destroy *Parlatoria blanchardi* on infested date palms, and their attached suckers by pruning and burning with the gasoline blast torch (described in Bull. 56 of the Arizona Agric. Exp. Stn.). A year after this, if the tree appears to have been successfully treated, as has proved the case with 90 per cent. of those burned in Arizona, the suckers may be cut and transplanted, still infested, however, with Marlatt scale. When the old tree ceases bearing suckers it becomes practicable to clean the bole and burn it more thoroughly to eradicate Marlatt scale, the tree being thus finally freed from both infestations. Transplanted suckers, which at the time of cutting could not have borne the severe burning necessary to deprive them of the Marlatt scale, can be followed up in the same way and finally cleaned.

**Outline of Administration in Controlling Insects and Fungi Injurious to Agricultural Plants in Japan.**—*Published by the Bureau of Agriculture, Tokyo,* 1913, pp. 3-32.

This pamphlet gives an outline of the administrative measures adopted by the Japanese Government for controlling disease and insect pests of agricultural plants. A special law has been enacted for checking and preventing the ravages of insects on the farm. The prefects of districts are empowered to issue orders to farmers to take such measures as may appear needful, and Governors are authorised, where necessary, to take measures for the extermination of pests at the expense of the local authorities, the whole of the work being superintended by inspectors sent from headquarters. Subventions may be granted to self-governing corporations to meet the expense of these measures. Details of the law are given, certain sections dealing specially with rice plants. Schedules are provided for reports on the use of trap-lanterns and for each species of insect against which special measures may be directed. Special regulations are laid down with reference to the exportation of rice, fruits and plants, and for the education and instruction of the agricultural population on matters relating to insect pests and plant diseases and the employment of travelling lecturers. A list of insect pests is given, with English, Japanese and scientific names.

*Insects injurious to rice-plants*:—Two-brooded Rice-plant Borer (*Chilo simplex*, Butl.), Three-brooded Rice-plant Borer (*Schoenobius bipunctifer*, Wlk.), Larger Rice-plant Borer

(*Sesamia* (*Nonagria*) *inferens*, Wlk.), Rice-plant Skipper (*Parnara guttata*, Brem.), Rice-plant Leaf-hopper (*Nephotettix apicalis*, Motsch.), White-striped Leaf-hopper (*Delphax purcipera*, Horv.), Brown Leaf-hopper (*Delphax oryzae*, Mots.), Smaller Brown Leaf-hopper (*Delphax striatella*, Fall.).

*Insects injurious to mulberry-trees*:—Mulberry-tree Geometer (*Hemerophila atrolineata*, Butl.), Mulberry-tree Borer (*Apriona rugicollis*, Chev.), Mulberry Scale (*Diaspis pentagona*, Targ.).

*Insects injurious to fruit trees*:—Orange-tree Borer (*Melanauster chinensis*, Forster), Peach-fruit Worm (*Astura punctiferalis*, Guen.), Pear-fruit Worm (*Nephopteryx rubrizonella*, Rag.), Red Orange Scale (*Chrysomphalus aurantii*, Mask.), Yellow Orange Scale (*Aspidiotus aurantii*, var. *citrinus*, Ckll.), San José Scale (*Aspidiotus perniciosus*, Comst.), Long Scale (*Mytilaspis gloveri*, Pack.), Cottony Orange Scale (*Pulvinaria aurantii*, Ckll.), Oyster-shell Scale (*Mytilaspis pomorum*, Bou.), Woolly Aphis (*Eriosoma lanigera*, Hausm.), Grape Phylloxera (*Phylloxera vastatrix*, Plan.), Apple-tree Aphis (*Aphis mali*, F.).

*Insects injurious to vegetables*:—28-spotted Ladybird (*Epilachna 28-punctata*, F.), Bean Aphis (*Aphis rumicis*, L.), Melon Beetle (*Aulacophora femoralis*, Mots.), Turnip-leaf Beetle (*Phaedon incertum*, Baly), Turnip Sawfly (*Athalia spinarum*, Pz.), Radish Aphis (*Aphis brassicae*, L.).

Against *Chilo simplex* (and also *Schoenobius* and *Nonagria*) it is recommended to collect the egg-clusters and capture the moths in the seed-beds about a fortnight before transplanting into the paddy field, and farmers are advised to continue the process even after transplanting. Infested stalks should be cut off close to the ground in the autumn, and if this prove unsuccessful, the stubble and roots should be dug up and burned. Trap-lanterns are recommended, with the water basin suspended about 6 inches above the young plants; in seed-beds there should be 4 or 5 lanterns to every $\frac{1}{4}$ of an acre. Farmers are recommended to keep the egg-clusters in a proper receptable so as to allow of the hatching out of parasites.

The Rice-plant Skipper should be destroyed as soon as noticed by passing some sort of comb-like apparatus through the leaves or rubbing them with the hand. Wintering larvae on grasses and rushes should be destroyed by burning. The Rice Leaf-hoppers should be captured with an insect net, or oil, at the rate of 6 quarts per acre, should be spread over the surface of the water in the paddy field, the plants being shaken to cause the insects to drop on to the oiled water, which is then drained off and fresh water let in. Petroleum is generally used, but fish or rape oil may answer the purpose. This method is said to be exceedingly effective in the early stages of the insect. For *Hemerophila*, hand-collection of the larvae is suggested. The eggs of *Apriona rugicollis* are laid in recesses in the branches or trunk of the tree. Whenever such holes are detected, petroleum or a similar insecticide should be poured into them by means of an injecting apparatus, or a wire thrust into the holes. It is said that if the trunk or branch be wrapped close to the ground with bamboo sheaths, palm fibre or paper, where possible, oviposition may be largely prevented. The Orange-tree Borer also

lays its eggs in the trunk close to the ground, and the part exposed to attack should be suitably protected with earth or straw, etc.

For scale-insects, kerosene emulsion 1:5 to 1:7 in winter, 1:20 in spring, and 1:15 to 1:20 in summer, may be used; and it is stated that full-grown branches and trunks resist the action of pure kerosene. Against Woolly Aphis fumigation with hydrocyanic acid is recommended for nursery stock, etc. In the orchard, kerosene emulsion 1:10 in winter and 1:15 to 1:20 in spring and summer; a coat of coal tar should be applied to cuts in the wood and to all holes and cracks; and where possible hydrocyanic acid fumigation may be applied. Badly affected trees should be dug out and burnt. The 28-spotted Ladybird is said to be very irregular in its development, eggs, larvae, pupae and adults being found in colonies at the same time on the under surface of the leaves. They should be destroyed by hand or by arsenical sprays. The insect hibernates as an adult in banks, among grasses or underneath stones in sunny places, and should be hunted out and destroyed in the winter months.

Bodkin (G. E.). **Insects injurious to Sugar-Cane in British Guiana, and their natural enemies.**—*Journ. Board of Agric., Br. Guiana*, vii, no. 1, July 1913, pp. 29-32.

This paper contains the following list of 32 species of insects injurious to sugar-cane in British Guiana.

Lepidoptera: (1) *Castnia licus*, F. (Giant Moth Borer); no true parasites known; several species of birds including the 'Old Witch' (*Crotophaga ani*) and 'Kiskadee' (*Pitangus sulphuratus*) prey on the adult. (2) *Diatraea saccharalis*, F., (3) *D. cinella*, Hmp., (4) *D. lineolata*, Hmp. (Small Moth Borers); the natural enemies are, egg-parasites: *Trichogramma* sp., and an undetermined species of *Telenomus*; two undetermined species of ants destroy both the parasitised and unparasitised egg-masses; the following Hymenoptera are parasites of the larva: *Iphiaulax* sp., *I. medianus*, Cam., *Cremnops* sp., *C. parvifasciatus*, Cam., *Mesostenoideus* sp.; a large Chalcidid, *Heptasmicra curvilineata*, Cam., has been bred from the pupa, as well as an undetermined Tachinid fly: a fungus parasite (*Cordyceps* sp.) attacks both larval and pupal stages; the larva of an undetermined Elaterid beetle and the Histerid beetle, *Lioderma 4-dentatum*, are predaceous on the larvae and pupae. (5) *Laphygma frugiperda*, S. & A. (Rice Caterpillar); the eggs are infested by a *Trichogramma*; *Henicospilus guyanensis*, Cam., and an undetermined species of Braconid are parasitic on the larva; a Coccinellid beetle (*Megilla maculata*, de G.), a wasp (*Polybia nigriceps*), several species of birds, and a toad (*Bufo marinus*) also destroy the larvae. (6) *Remigia repanda*, F. (Grass Caterpillar); affected by a bacterial disease. (7) *Calymniodes* (*Prodenia*) *latifascia*, Walk. (8) *Lycophotia infecta*, Ochs. (9) *Monodes agrotina*, Guen. (10) *Pamphila* sp. (11) *Philisora catullus*, F.; from the pupa an undetermined species of Chalcidid has been

bred. (12) *Caligo illioneus illioneus*, Cram., an undetermined *Telenomus* attacks the eggs, and a large species of Chalcidid has been bred from the pupa.

Coleoptera: (13) *Xyleborus* sp. (Shot-hole Borer). (14) *Dyscinetus bidentatus* (Small Black Hardback). (15) *Cyclocephala signata* (Brown Hardback). (16) *Phileurus bajulus*, F. (17) *Rhyncophorus palmarum*, L. (Palm Weevil). (18) *Metamasius hemipterus*, L. (Weevil Borer). (19) A small brown Chrysomelid Beetle (undetermined).

Rhynchota: (20) *Aspidiotus sacchari*, Ckll. (Sugar-cane Aspidiotus); parasitised by an undetermined Chalcidid. (21) *Pseudococcus calceolariae*, Mask. (Sugar-cane Mealy Bug); attacked by a fungus, *Aspergillus* sp.; two species of Coccinellids (undetermined) prey on the Mealy Bug, and another, *Cryptolaemus montrouzieri*, has also been introduced; a number of species of ants foster the Mealy Bug. (22) *Pseudococcus sacchari*, Ckll. (23) A species of *Pulvinaria*. (24) *Orthezia insignis*, Douglas. (25) *Pseudococcus citri*, Risso. (26) *Tomaspis pubescens* (Froghopper). (27) *Tomaspis* sp. (28) A species of leaf-hopper (undetermined); the eggs are parasitised by a small Hymenopteron.

Isoptera: (29 and 30) Termites; two species not yet determined.

Orthoptera: (31) *Conocephaloides maxillosus*, F. (32) *Schistocerca pallens*, Thunb.

Paczoski (I. K.). О ГУСЕНИЦАХЪ ПОѢДАЮЩИХЪ ЛИСТЬЯ ПЛОДОВЫХЪ ДЕРЕВЬЕВЪ [On caterpillars devouring leaves of fruit-trees].—*Published by the Zemstvo of Cherson*, 1913, 29 pp.

This is a popular booklet, in which the author draws the attention of fruit-growers to some pests whose caterpillars damage leaves of fruit trees, with special reference to conditions and dates in the Government of Cherson. The following insects are dealt with:—

*Hyponomeuta malinellus*, the caterpillars of which are known by the popular name of "May worms." The moths appear in the Government usually in the second half of June and start pairing and ovipositing after a few days. The mode of placing the eggs, the damage done by the caterpillar and the appearance of the latter, as well as of the imago, are described, and the necessity of fighting the pests either by removing or destroying its eggs or by insecticides is pointed out. *H. variabilis* is also found in the Government, chiefly on plum trees. *Malacosoma neustria*. The rings of eggs of this moth may be noticed on branches of fruit trees after the middle of the summer, but it is not until the next spring that the caterpillars emerge. The latter are described and figured, as well as the damage done by them. The caterpillars start pupating in the first half of June, and the moths emerge at the end of June. Remedies, such as collecting the eggs, hand-picking the caterpillars, and especially spraying, are recommended. *Euproctis chrysorrhoea*. The author

describes the "winter nests" of the caterpillars, the damage done by them in the spring and in the summer, the different stages of the insects and their mode of oviposition. He gives two figures of the nests; before the falling of the leaves and after. The only remedy is the burning of the nests. Although injuring chiefly fruit trees, the nests are found also on various other trees and must be destroyed everywhere. *Lymantria dispar* is similarly described. The caterpillars are sometimes carried by wind over considerable distances; they injure all sorts of deciduous and coniferous trees in the South of Russia, but especially oak and poplar. The remedies recommended are, smearing the egg-masses with a mixture of kerosene (2 parts) and birch tar (1 part), and the use of tangle foot belts. In the last part of the book the author gives some information relating to sprayers, insecticides, &c.

Maassen. **Weitere Mitteilungen über die seuchenhaften Brutkrankheiten der Bienen, insbesondere über die Faulbrut.** [Further communications regarding the pestilential brood-sicknesses of bees, especially foul brood.]—*Mitt. aus der Kaiserl. Biolog. Anstalt für Land- und Forstwirtschaft, Berlin,* 8th Ann. Rept., pt. 14, April 1913, pp. 48-58.

In his present researches the author has fed with the bacteria of foul brood, bees which were kept under ordinary conditions of freedom. In no case did sickness result, which proves that foul brood cannot be produced by administering pure cultures of *Streptococcus apis* and *Bacillus alvei*. Then sick or dead larvae were ground up and mixed with honey. Bees fed on this developed sickness in a mild form from which they all had recovered in 2 or 3 months.

The author refers to the fact that the measures he has advocated before have been successful in stamping out the disease wherever they have been adopted. They prove that the destruction of the swarms and of the hives is not absolutely necessary. He reports the appearance in Germany of a new disease, which seems to be already known in England. It is caused by *Aspergillus flavus*. The badly stricken colonies and their combs must be destroyed, preferably by fire. The colonies which are only mildly attacked may be spared, as they may recover; but this should not be relied on, and it is safer to destroy them. All dead bees must also be removed. The hives may be disinfected in the same way as for foul brood.

Feytaud (J.). **La destruction naturelle de la Cochylis et de l'Eudémis.** [The destruction of Cochylis and Eudemis in nature.]—*Procès-verbaux de la Soc. Linn de Bordeaux,* lxvii, Mai-Juillet 1913, pp. 90-100.

Cochylis (*Clysia ambiguella*, Hb.) and Eudemis (*Polychrosis botrana*, Schiff.), two of the principal pests of vines, have many natural dangers to combat. Firstly, weather conditions affect

the development of the caterpillars and the emergence of the moths—for example, while warm years, such as 1900, 1906 and 1911, were favourable to *Polychrosis*, cold years, such as 1910, retarded all the stages of development; with *Clysia* the reverse is the case, and within certain limits, it prefers the cold, and suffers in warmer years. Diseases caused by Sporozoa in these insects are not as yet worked out; but those due to entomophytic fungi of the group *Isaria* are well known. In the south of France larvae and pupae of *Clysia* are occasionally found killed by *Botrytis bassiana*, and still more frequently by *Isaria farinosa tenuipes*. Attempts to infest caterpillars and pupae artificially with the spores of this fungus were very successful, especially in a damp atmosphere. Up till the present, work has not been carried out on a large scale, but the successful experiments made in Russia by Metschnikoff and Krassilstchik in combating the Cleonus of beetroots with *Isaria destructor*; by Giard, Le Monnier, Prillieux, and Delacroise in spreading *Isaria densa* among May bugs; and by Forbes against *Blissus leucopterus* and Trabut against the *Haltica* of the vine by means of *Sporotrichum globuliferum*, all show that the artificial cultivation and injection of such fungi may prove of great economic importance.

Among the most important of predaceous insects are *Coccinella septempunctata*, which eats the young caterpillars; *Malachius*, inoffensive in the perfect condition, but having carnivorous larvae; *Opilo mollis* and *Denops albofasciatus*, whose larvae resemble those of *Malachius* in feeding habits; *Chrysopa vulgaris*, L., *Hemerobius perelegans*, L., and *Syrphus hyalinatus*. Amongst parasitic Hymenoptera are numerous *Pimpla* of different species, *Apanteles Sacchariana*, *Phygadeuon*, Hemitelids, and *Omorgus*: these all lay their eggs in the larvae of both moths. The eggs are attacked by *Trichogramma semblidis*, which has about 12 generations in the year, but only about three are in the eggs of the vine moths.

The author suggests various lines of research which would lead to a knowledge of how these natural enemies may be utilised. For example certain plants encourage the multiplication of these insect enemies, and should be cultivated alongside the vine; the life-history and habits of the different enemies should be studied and taught to agriculturists; the protection of these insects and the possibility of their transportation into new regions also afford subjects for research.

Russell, H. M. Observations on the egg-parasites of *Datana integerrima*, Walk.—*Proc. Entom. Soc., Washington*, xv, no. 2, June 1913, pp. 91-97, 4 tables.

The year 1907 was very favourable to *Datana integerrima*, Walk., the black walnut caterpillar, which was extremely abundant on the pecan, and destroyed the foliage extensively. This abundance apparently resulted in a great increase of the egg-parasites of this insect, as the eggs of the last generation in the autumn of 1907 were heavily parasitised. This probably

accounted for the smallness of the first brood in 1908. In the autumn of 1908 the author collected a number of egg-masses of *D. integerrima*, from which he reared four species of parasites, viz., *Trichogramma minutum*, *Baryscapus* sp., *Telenomus sphingis*, Ashm., and *Oencyrtus* sp. The records of the experiments are given in tables. The first table shows the parasitism of the eggs from September to October. The total number of *Datana* eggs was 10,926; the number of *Datana* larvae hatched was 3,924; the number of parasites was 6,565; leaving a total of 637 eggs unhatched. The second table is a record of the emergence of the parasites, arranged according to date. The third table summarises the results obtained from September to November and shows the numbers of each species of parasite. *Telenomus sphingis* was by far the most common; then came *Oencyrtus*, *Trichogramma minutum*, and lastly *Baryscapus*. The fourth table gives the records for the spring brood of 1908. This table shows that 45 per cent. of the eggs hatched, 39 per cent. were parasitised, and 14 per cent. failed to hatch.

Morgan (A. C.). **An Enemy of the Cigarette Beetle.** — *Proc. Entom. Soc., Washington*, xv, no. 2, June 1913, pp. 89-90.

In a paper read before the society, the writer describes how he found larvae of a Clerid beetle infesting bundles and boxes of old cigars. The object of the search was to determine the extent of damage done by the cigarette beetle, *Lasioderma sericorne*, F. Experiments very quickly demonstrated that the newly found Clerid larvae, which are bright red and very active, were predaceous upon the larvae and pupae of the *Lasioderma*, and later the adult was found to have the same feeding habits. The adults proved on examination to belong to the species *Thaneroclerus girodi*, Chevr. Its presence in tobacco from Cuba was discovered in France and is referred to by Chevrolat (Bull. Ent. Soc. France, 1880, p. xxxii), who says that it was likely to be predaceous upon the larvae and perfect insects of the genus *Catorama*, the genus to which the species which is now called *Lasioderma sericorne* belongs. *Thaneroclerus* undoubtedly occurs also at Tampa, Florida.

In discussing the paper, Mr. Schwartz mentioned that another enemy of dry Cuban tobacco, viz., *Catorama tabaci*, Guérin, has recently been found.

Assmuth (J.). **Wood-destroying White Ants of the Bombay Presidency.**—*Jl. Bombay Nat. Hist. Soc.*, 1913, xxii, no. 2, pp. 372-384, 5 pl.

Seven species of white ants are described, viz., *Leucotermes indicola*, Wasm., *Coptotermes heimi*, Wasm., *C. parvulus*, Holmg., and *Odontotermes feae*, Wasm., which are the most important wood destroyers: *Calotermes* (*Neotermes*) *assmuthi*, Holmg., *Microtermes anandi*, Holmg., and *Microcerotermes heimi*, Wasm., which though noxious, are of rarer occurrence

than the first four. The characters of the insects themselves and their methods of attack are described. As regards which woods are more or less termite-proof, the author states that it is impossible as yet to settle definitely, nor is it possible to rely in all cases on advertised "Termicides." He suggests that the only method to pursue at present is co-operation in furthering the study of the biology of these forms, for with a fuller knowledge of their habits and life-history there will be more chance of successfully combating their ravages.

Kershaw (J. C.). **A New Froghopper from Tobago.**—*Bull. Entom. Research, London*, iv, pt. 2, Sept. 1913, p. 143.

A new species of froghopper, *Tomaspis carmodyi*, is described, found on grass in the island of Tobago, B.W.I.

Distant (W. L.). **A Bug attacking *Sesamum indicum*, L.**—*Bull. Entom. Research, London*, iv, pt. 2, Sept. 1913, p. 143.

This is a short note upon *Phricodus hystrix*, Germ., a Pentatomid bug found in South and Central Africa, Madagascar, and Mauritius. It was recently sent to the author from Coimbatore, S. India, with the information that it was found on Gingelly plants. The Gingelly is an oil-plant (*Sesamum indicum*, Linn.) and is distributed all over Tropical Africa, so that the insect will probably be found infesting the plant in Africa as well as in India.

Vassiliev (Eug. M.). СПИСОКЪ ЖИВОТНЫХЪ ВРЕДИТЕЛЕЙ ЛЮЦЕРНЫ [List of pests of Lucerne]. Entom. Exp. St. of the All-Russ. Soc. of Sugar Refiners in Smiela, Govt. of Kiev. —Reprinted from the journal "ХОЗЯЙСТВО," Nos. 16 & 17, 1913. *Kiev*, 1913, 8 pp.

In a book on lucerne by V. V. Mansurov, issued by the Zemstvo of Kiev, there are only mentioned three pests of this plant and the author supplements this statement by a review of all the known pests of lucerne noticed in Europe and in Russia during the last few decades, according to Prof. Kirschner and other authors. As to insects found in South Russia, and particularly in the Government of Kiev, a decision as to whether certain insects are or are not to be regarded as pests is a matter for further observation.

*Root Pests.*—

Coleoptera: The larvae of *Melolontha melolontha*, L., *M. hippocastani*, F., *Rhizotrogus solstitialis*, L., and Elateridae; *Hylastinus obscurus*, Marsh.

Diplopoda: *Julus londiniensis*, Leach, *J. unilineatus*, Koch.

Nematoda: *Heterodera radicola*, Greeff, also damages melons; *H. schochtii*, A. Schmidt.

*Pests injuring Leaves and Stalks.*—

Coleoptera: *Lethrus apterus*, Laxm., *Sibinia* sp., *Hypera murina*, F., *H. meles*, F., *H. variabilis*, Hbst., *H. adspersa*, F., *Otiorrhynchus ligustici*, L., *Sitones lineatus*, L., *S. lineellus*, Bonsd., *S. sulcifrons*, Thb., *S. griseus*, F., *S. tibialis*, Hbst., *Barynotus obscurus*, F., *Derocrepis rufipes*, L., *Phytodecta fornicata*, Brüggm., *Colaspidema atrum*, Oliv., *Longitarsus pratensis*, Pz., var. *medicaginis*, All., *Subcoccinella 24-punctata*, L., and *Thea 22-punctata*, L. (feeds on mycelium of fungi and is not likely to cause any serious damage).

Lepidoptera: *Lithocolletis nigrescentella*, Logan, *L. insignitella*, Z., *Coleophora medicaginis*, H.S., *Epithectis nigricostella*, Dup., *Anacampsis biguttella*, H.S., *Phasiane clathrata*, L., *Biston graecarius*, Stgr., *Euclidia mi*, Cl., *E. glyphica*, L., *Lasiocampa trifolii*, Esp., *Macrothylacia rubi*, L., *Dasychira fascelina*, L., *Plusia gamma*, L., *Chloridea dipsacea*, L., *Pieris napi*, L., *Colias hyale*, L., *C. edusa*, F., *Lampides baeticus*, L., *Lycaena argiades*, Pall., *L. argyrognomon*, Brgst., *L. icarus*, Rott., *L. dolus*, Hb., *L. cyllarus*, Rott.

Rhynchota: *Aphis medicaginis*, Koch, *Macrosiphum pisi*, Kalt., *Myzocallis ononidis*, Kalt.

Diptera: *Perrisia ignorata*, Wachtl, *P. lupulinae*, Kieff., *Asphondylia* sp., *Agromyza nigripes*, Mg., *Phytomyza affinis*, Fall., *Anthomyia funesta*, Kühn.

Acari: *Tetranychus telarius*, L., *Eriophyes plicator*, Nal.

Nematoda: *Tylenchus devastatrix*, Kühn.

*Pests injuring the Flowers and Seeds.*—

Coleoptera: *Epicometis hirtella*, L. (*Tropinota hirta*, Poda), *Apion pisi*, F.

Lepidoptera: *Phlyctaenodes sticticalis*, L., *Lycaena icarus*, Rott.

Rhynchota: *Adelphocoris lineolatus*, Goeze, one of the most serious pests of lucerne in Kiev.

Diptera: *Contarinia medicaginis*, Kieff., *Asphondylia miki*, Wachtl.

Acari: *Eriophyes plicator*, Nal.

Clarke (John M.). **Twenty-eighth Report of the State Entomologist, 1912.**—*New York State Museum*, Bulletin no. 165, 15th July 1913, pp. 264, 79 figs., 14 pls.

Nineteen pages of this report are devoted to the Codling Moth (*Cydia pomonella*, L.), the damage done by it and methods of prevention, with tables showing the results of the various operations conducted. The Hessian Fly (*Mayetiola destructor*, Say) is dealt with also at a considerable length and the following parasites are enumerated, some of which are so active that it is said that 70 per cent. of the pupae found in a representative sample of infected wheat were infested and less than 12 per cent. were in a condition to produce flies. The most abundant parasites

were *Merisus destructor*, Say, and *Tetrastichus carinatus*, Forbes; and one specimen of *Eupelmus allyni*, French, one of *Callimome*, one of *Pleurotropis* and a Pteromalid were obtained. In addition to these a wingless species *Homoporus subapterus*, Riley, is reported as being very efficient in Missouri, and *Platygaster herricki*, Pack., and *Entedon epigonus*, Walk., should be of assistance in checking this pest. *Pteromalus pallipes*, Forbes, is another species which preys upon the Hessian fly.

The remedial measures consist in late sowing, good culture, the use of trap strips, the burning of stubble and chaff or ploughing them under, the destruction of all volunteer wheat, and proper rotation of crops. Reference is made to bibliographies in the report of the Entomologist for 1901 (New York State Museum, Bulletin 53, pp. 705-730) and to a list of more recent literature by Hayhurst in the Jl. Econ. Entom., 1909, 2, pp. 231-34.

The Fall Army Worm (*Laphygma frugiperda*, S. & A.) has attracted attention in consequence of the injury done to lawns. A bibliography from 1797 to 1912 is given.

The Elm-leaf Beetle (*Galerucella luteola*, Müll.) did great damage in certain districts, but on the whole not so severe as in the exceptional season of 1911. Methods and results of spraying are given. Various species of *Lachnosterna* recorded in New York State are illustrated with remarks on their life-history and the damage done. A common parasite of these beetles in Illinois is *Tiphia inornata*, Say; also *Myzine sexcincta*, F., and *Ophion bifoveolatum*, Brullé; *Sparnopolius fulvus*, Wied., and *Pyrgota undata*, Wied., have been reared from larvae in Illinois, but these species are unfortunately not common in New York State. The destructive work of the Hickory Bark Borer (*Eccoptogaster quadrispinosa*, Say) in the Hudson Valley, which began some three years ago, has been continued in the past season. The effect of various remedies is discussed and the opinion is expressed that these borers attack trees which, for some reason or another, are not in good health. It is advised that whenever the attack is serious all infested trees or parts of trees should be cut out and the bark destroyed before the following June. Firewood with the bark on should all be burnt during the winter, otherwise the bark should be stripped.

Pear Thrips (*Euthrips pyri*, Daniel) is understood to be widely distributed in the Hudson Valley; it is a local pest with a curiously restricted range, sometimes attacking one portion of an orchard only. The insect was first discovered in California and has been recorded from a number of localities in the Hudson Valley and at Geneva. It appears to affect principally trees growing on healthy soil where early and thorough cultivation is either difficult or impossible. Certain orchards on light sandy soil at Kinderhook for example are free from the pest. This may be a coincidence, but as the insect winters in the soil and in one particular instance did serious damage to certain orchards which were not cultivated till late, it is suggested that early and thorough cultivation may prove a good remedy.

Klingner. **Kann Reblaub aus Weinbergen, die zum zwecke der Heu- und Sauerwurm-Bekämpfung mit Nikotinseifenbrühe bespritzt wurden, verfuttert werden?** [Can vine leaves, which have been sprayed with nicotin soap spray to combat the vine moths, be used for fodder?] — *Weinbau der Rheinpfalz. Neustadt a. d. Hdt.*, i, no. 16, 5th August 1913, p. 176.

In view of the susceptibility of animals to nicotin poisoning the author has examined this question. Premising that no data from practical experience are at present to be had, he nevertheless bases an affirmative reply on the following grounds:— (1) The spray in use contains 100 parts by weight of water, 1 part soap jelly and 1½ parts tobacco extract. The percentage of soap is quite harmless. The tobacco extract used usually contains 10 per cent. nicotin which is its only poisonous component. Thus 10,000 parts of spray contain 15 parts of nicotin, which is mostly free and therefore evaporates in a few days. What remains is not poisonous. Any taste still present is due to the residues. (2) As the spray is chiefly directed on the flowers and on the grapes very little of it reaches other parts. (3) Even the grapes which have been heavily sprayed may be eaten without danger, as each vine only receives a small quantity of spray in which the nicotin averages about ·187 milligram.

The author was confirmed in this opinion by the veterinary surgeon of the district. Care must be taken to mix the spray thoroughly and in proper proportions.

**Der Apfelwickler (*Carpocapsa pomonella*, L.) und seine Bekämpfung.** [*Cydia* (*Carpocapsa*) *pomonella* and its repression.]— *Kgl. Lehr- und Versuchsanstalt für Wein- und Obstbau in Neustadt a. d. Haardt. Weinbau der Rheinpfalz, Neustadt a. Hdt.*, i, no. 15, 23rd July 1913, pp. 170-171.

Latterly complaints of damage done by *C. pomonella* in the Rhine Province have increased. The provision is recommended of artificial places in which the larvae can winter or pupate. Tree bands are useful. Those commercially obtainable are of corrugated millboard; they are fixed round the trunk, tightly tied at the upper edge and loose at the lower one, so that the caterpillars can find shelter. Even better is a 6-inch belt of woodwool protected against rain by parchment paper. In the Rheinpfalz caterpillars should be collected at the end of September, if there is only one generation a year. If two, then about the middle of July, when the trap must be refixed.

Fallen fruit should be collected as soon as possible after they drop, in order to destroy the caterpillars before they leave. The trees must be strongly shaken to make worm-eaten fruit fall. The trees should be cleaned in the usual manner in winter, and the store-room windows must be closed during the season of flight. If all these measures are adopted by all the fruit-growers in a district, they will often prove successful.

Schwangart (Dr.). **Weinbau und Vogelschutz.** [Vine-growing and Bird Protection.]—*Weinbau der Rheinpfalz, Neustadt a. d. Hdt.*, i, nos. 15, 16, 23rd July and 5th Aug. 1913, pp. 166-169, 179-181.

In the course of his address to the 2nd German Bird Protection Congress, held at Stuttgart from 12th to 14th May, Dr. Schwangart vouched for the usefulness of the swallow in vineyards, where they catch the vine moths. Bats are equally useful in the twilight and at night. He holds that the useful insects suffer little from insect-eating birds, and strongly advocates bird protection, with due consideration for the conditions under which vine-growing is carried on.

Martelli (P.). **Insektenfeinde der Bücher.** [The insect enemies of books.]—*Entom. Zeits., Frankfurt a/M*, xxvii, nos. 25 and 26, 20th and 27th Sept. 1913, pp. 142-143 and 147-149.

This review of the various book-pests contains a note on the usefulness of the scorpion tick (*Chelifer cancroides*) in combating the book-louse. The author points out the excellence of carbon bisulphide for fumigation purposes. The method is simple: a saucer containing the chemical is placed with the books in an iron box, 2 oz. being sufficient for a space of 60 cubic feet, and in 24 hours the destruction of eggs, larvae and insects is complete. Pouring in the chemical and the subsequent opening of the box must be done by daylight, as carbon bisulphide when mixed with air produces an explosive compound. With proper care there is no danger. The box is best kept in a well-ventilated room.

Paczoski (I. K.). НАСѢКОМЫЯ, ПОВРЕЖДАЮЩІЯ КУКУРУЗУ [Insects injurious to Maize].—*Published by the Zemstvo of Cherson*, 1913, 14 pp., 5 figs.

This is a popular pamphlet issued by the Zemstvo, containing useful information as to some pests of maize, the cultivation of which is increasing rapidly in the Government and is of great importance.

The author deals first with *Pyrausta nubilalis*, Hb. (*Botys silacealis*, Hb.), describing and figuring the larva and moth. The hibernating caterpillars pass the winter in the lowest parts of the stalks of maize, as well as of millet and of hemp (they injure also sunflowers and hops); they pupate at the end of spring, usually in May, the moths issuing three weeks afterwards, not before June. The females oviposit on maize, the caterpillars appearing a fortnight later and feeding for some time on the outside of the plants; they afterwards penetrate into the stem. The author doubts whether this insect has two generations in the government, as assumed by some other observers. The best remedy is suggested by the mode of wintering of the insects; the maize stubble ought to be removed and burned, and the millet stubble ought to be ploughed in deeply, immediately after the

harvest. This removal of maize stubble can be done in the autumn; or, if it is desired to retain the stubble in the fields to arrest and keep the snow, so as to ensure the moistening of the soil, it can be removed in spring, as the larvae pupate late. As some larvae remain on the upper parts of the plants which are taken home after the harvest, the latter must be disposed of, either as food or as fuel, not later than in May, so as to prevent the further development of the caterpillars.

The sown grains of maize are damaged in the spring by the larvae of *Agriotes lineatus*, L., and related beetles of the family Elateridae. In the southern parts of the Government the Elaterid beetle, *Athous niger*, L., appears, living usually on unploughed ground or on old pasture freshly ploughed, but avoiding ploughed land, so that they do damage on newly broken ground only for a year or two. *A. lineatus* is found in the northern parts of the Government and its larvae cause considerable injury to seed maize soon after it is sown. The author is not satisfied that trap-sowings of poisoned maize, some time before the actual sowing, are of any use, as the larvae do not appear to touch poisoned seed. The remedy suggested consists in the late sowing of maize, when the higher temperature assists the rapid growth of the plants; the seeds ought also to be put into water before sowing, so that they may grow more quickly. The insects injure only the seed and are not dangerous to grown plants. It is also recommended to replough the fields in June, immediately after the harvest, when the larvae start pupating.

The last pest mentioned in the pamphlet—*Pentodon monodon*, F.—gnaws through the part of the stem beneath the soil. Its activity begins early in June and continues till the middle of August, when, having oviposited in the soil the insects perish. Hand-picking is recommended as a remedy, also trenches round the field, in which the insects can be collected.

Paczoski (I. K.). ОДЕНКА МОХНАТАЯ И БОРЬБА СЪ НЕЮ [*Epicometis hirtella*, L., and the fight against it].—*Published by the Zemstvo of Cherson. Third, enlarged edition, Cherson*, 1913, 22 pp.

*Epicometis hirtella*, L. (*hirta*, Poda) has only lately attracted the attention of fruit-growers, owing to the ever-increasing amount of damage done by it and the author points out that this is due to the increased ploughing up of virgin land and the destruction in this way of the wild plants, which have previously served as food for the insects. The species is found in southern and middle Europe, but is noticeably injurious only in South Russia, Hungary and in parts of Italy. In the Government of Cherson the insects emerge from the earth, where they hibernate in the imago stage, earlier or later in April. In warm, calm weather they invade orchards in swarms and devour the ovaries of fruit blossoms; sometimes the whole harvest in an orchard is thus destroyed in 2 to 3 days; in rainy, gloomy or windy weather they either remain in the earth, where they usually pass the night, or do not wander in search of food, but devour the plants on

the spot, sometimes eating even the leaves of low trees. Besides blossoms of fruit trees they feed also on all wild plants, except grasses, sedges and some others, while among cultivated plants they attack also the vine, rye and rape. In Cherson they start attacking rye in the first half of June, after the blossoming of fruit trees is over and they forcibly extract the ears from their sheath.

The females oviposit in earth at a depth of 1½-2 inches, selecting soft soil, rich with decaying matter. According to J. F. Schreiner, they oviposit preferably in the small heaps of earth formed by mice in the fields, where the latter hide ears and stems of grasses, which, decaying in the spring, provide food for the young larvae. A week after the oviposition the larvae issue; they resemble those of *Anisoplia austriaca*, differing from the latter by the way they move, without using their legs, on their sides or backs. At the end of July and in the first half of August the larvae pupate, producing the imago in about 15 days. The latter however does not emerge from the cocoon, but remains inside over the winter, not appearing till the next spring.

Coming to the question of remedies, the author first deals with some of those usually applied or recommended, which, according to him, are of no use, such as:—spraying, which has not given any practically valuable results; fumigating; beekeeping—some authors declared that *E. hirtella* avoids gardens where bees are present, which however is wrong; and the cultivation of tall trees, which remedy cannot be any protection against the insects.

The author recommends the following remedies:—(1) ploughing of the fields on which oviposition by the insects has been noticed. If the fields are under crops, the ploughing must be done immediately after the harvest is completed. Before ploughing the depth at which the eggs or larvae are found ought to be ascertained; the latter depends on the wetness of the soil, and the ploughing must be done accordingly, and the land harrowed the next day. The best results would be obtained by applying this remedy early in June. Ploughing after the harvest may also be useful against various other insects. (2) To preserve, so far as possible, wild plants on steppes and similar places, thus keeping the insects away from the orchards. (3) To plant wild steppe cherry or thorn bushes round orchards, taking care however to destroy various other insects which may breed on them, and at the same time collecting the *Epicometis*. According to Plodovsky, rhubarb (?) is very suitable for this purpose, as it is attractive to insects and blossoms at the same time as many fruit-trees, and remains in bloom for a long time. (4) The more valuable sorts of plants ought to be protected by gauze round their crowns. This is specially recommended by Mokrzecki and is done in the Government of Taurida; the cost is about 2*s*. 6*d*. for a tree of medium size. (5) Birds destroying the insects ought to be protected. (6) Hand-picking. Some time ago the Zemstvo of the Government paid a premium for hand-picking. Lately this has been discontinued, but taken up by some of the District Zemstvos. The premium paid varies from 2½*d*. to 5*d*. per

1¼ litres. The author urges the necessity for applying this remedy, as one by means of which the number of the insects may be materially decreased; which, according to him, is all that is wanted. These insects are injurious only when in great numbers, otherwise playing a useful part in diminishing the excessive quantity of fruit which may otherwise be found on trees, but which could not all develop. Before collection, spraying with water is useful, as it makes the insects sluggish and sometimes causes them to drop to earth; the spray must be very fine. (7) The author suggests trying the remedy recommended by Schreiner which consists in catching the beetles on sheets of blue paper, smeared over with sticky matter; evidently the blue colour attracts the insects. The sticky matter according to Kintzel, a gardener in the Government of Astrachan, who drew the attention of Schreiner to this remedy and obtained excellent results, is prepared by heating slightly 7 parts of pine pitch and adding to them 3 parts of linseed oil and 1 part of vaseline. This is slightly boiled and smeared on the sheets of paper. The latter are put in the orchards amongst the trees, in sunny spots.

Carpenter (G. H.). **The Life-History of Insects.**—*Camb. Manuals of Science & Literature, Camb. Univ. Press,* 1913, 134 pp., 1 pl., 23 figs.

This volume is an outline sketch of the facts and meaning of insect metamorphoses, dealing with growth and corresponding changes in form, larvae and their adaptations, pupae and their modifications; the life-history of certain sucking insects is dealt with in some detail, including the Aphids and the Mussel Scale-insect (*Mytilaspis pomorum*). There is a chapter on the palaeontology of insects and its significance. A bibliography is given.

Barbey (A.). **Traité d'Entomologie Forestière.**—*Paris & Nancy,* 1913, 617 pp., 350 figs., 8 pls.

This is a comprehensive and very useful manual of Forest Entomology. An introductory chapter deals with the occurrence in general of insects in forests, with brief references to the kinds of damage they may do. The second chapter is a purely zoological one, dealing with the anatomy of insects, and includes a broad classification. The greater part of the book is subdivided under the names of the principal forest trees, and an account is given of the insects which attack each tree, with the methods of combating them. There is a short chapter on useful insects, and a comprehensive bibliography.

McColloch (J. W.). **A Parasite of the Chinch Bug Egg.**—*Science, New York,* xxxviii, p. 976, 12th Sept. 1913, pp. 367-368.

In experiments conducted this year to determine the time of the first appearance of young chinch bugs, and the mortality of the eggs, it was discovered that a large number of the eggs

examined were parasitised. The life-history of the parasite was worked out for four generations until 5th July. From 5th-23rd July only an occasional parasitised egg was found in the field, but from then onwards they were obtained in large numbers. Up to the time of writing, over 325 individual parasites had been bred. The length of the life-cycle was found to vary from 10-18 days, depending on the climatic conditions. The parasite was found in every wheat and cornfield examined round Manhattan. Of 3,101 eggs collected between 28th April and 10th June the percentage parasitised was 20·8, and of 116 eggs collected at Crawford (Central Kansas) the percentage was 16·3. The parasite has also been taken at Dodge City (S.W. Kansas). The work is proceeding and a description of the parasite and its life-history and efficiency will be published later. Regarding the systematic position of the insect, it is found that the species will require a new genus; it is probably a member of the family Proctotrypidae, and is related to the genus *Telenomus*.

Sacharov (N. L.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ ЗА 1912 ГОДЪ [Report of the Entom. Sta. of the Astrachan Soc. of Fruit-growing, Gardening, Market-gardening, and Field-cultivation].—*Astrachan*, 1913, 25 pp.

In a short preface to his report the author gives the history of the Station, which was founded in 1911 and is supported by contributions from the Department of Agriculture, the Zemstvo and the local Horticultural Society.

Chief among the pests of the year under report must be placed *Phlyctaenodes sticticalis*, L., which hatched in such enormous quantities, that the steppes in three districts (Zarev, Enotaev and Krasnojar) were literally covered by the caterpillars: they destroyed the whole of the weeds and wormwood plants on the steppes, and then migrated in masses, playing havoc with crops, orchards and market-gardens. During their migrations the insects filled the streets of the villages and even penetrated into the houses, the population being helpless against them. The invasion of the area of cultivated plants began on the 17th July and continued till the 26th, when the caterpillars started passing into the earth to pupate. The first generation appeared at the beginning of May, and it was these caterpillars which were responsible for the enormous damage. The pupal stage lasted about 11 days (from the 25th July to the 5th August); the moths of the second generation began to oviposit on the 6th August, the caterpillars appeared on the 11th August and began pupating on the 1st September, and several days after, the third generation appeared. About 20 per cent. of the caterpillars of the first generation and about 28 per cent. of those of the second hibernated in the pupal stage. The caterpillars fed on all weeds and cultivated plants except *Euphorbia* among the former and tomatoes and *Solanum nigrum*, L., among the latter. About 35 per cent. of the larvae of the first generation were infected by parasites, among which were noticed:—

Braconidae: *Microtypus sacharovi*, Kok. sp.n., found only in South Russia and Transcaspia; *Agathis longicauda*, Kok.; *Apanteles ruficrus*, Hal., a parasite of the caterpillars of the third generation; *Apanteles* sp. Ichneumonidae: *Omorgus lugubrinus*, Holm., *Angitia chrysosticta*, Gmel., *Labrorychus debilis*, Wesm., var. n. *phlyctaenodis*, Kok., *Cremastus ornatus*, Sz., and *Mesochorus* sp.

Except *Apanteles*, which parasitises the larvae, and the *Mesochorus*, which is a hyperparasite of Tachinids, all the other species emerged from the pupae. Two Tachinids also attacked the larvae, *Tritochaeta polleniella*, Rond., and *Nemorilla maculosa*, Mg.

Another serious pest of the melon-fields is *Euxoa segetum*, Schiff., which appeared at the end of May and injured not only melons but also other vegetables; neither summer- nor winter-sown grain crops suffered from this pest. The author is of opinion that *E. segetum* has there two generations.

A list is given of all the saltatorial Orthoptera observed in the Government during 1912, amounting to 37 species, of which the most injurious are, *Locusta (Pachytylus) migratoria*, L., and *L. danica*, L., both of which are found in the south, the latter forming 10-15 per cent. of their numbers. In the steppes are found *Caloptenus italicus*, L., *Oedipoda coerulescens*, L., and *Oedaleus nigrofasciatus*, de G. The Asiatic locusts breed on the banks of the arms of the Volga and on the coasts and islands of the Caspian Sea, in places which are covered with reeds. The hatching of the locusts in the lower parts of the Volga occurs between the 18th and 28th May; the whole development requires about 42 days (23rd May to 5th July), and oviposition proceeds throughout September.

The following parasites were obtained:—From 1 to 3 larvae of *Sarcophaga lineata* were found in the thoracic cavities of full-grown nymphs of locusts; while 5 to 7 larvae of a fly of the genus *Anthomyia* were found in the thorax of some adult locusts. The following Meloid beetles were obtained from the egg-masses of Asiatic locusts and *Caloptenus italicus*:—*Zonabris 4-punctata*, *Z. variabilis*, *Z. impar*, *Z. 14-punctata*, *Z. floralis*, *Z. dejeani*, *Z. 10-punctata*, *Z. zebrae*, *Z. crocata*, *Z. calida* and *Epicauta erythrocephala*. The eggs were also parasitised by the larvae of a Bombyliid fly, *Systoechus* sp., and in some cases a fungus disease, *Empusa grylli*, was found on them.

*Caloptenus italicus* has done considerable damage to fruit trees in some parts by eating the leaves; another species damaged young apples by gnawing them. This year the experiment of fighting locusts by chemical remedies was tried for the first time and gave excellent results.

Although fruit-growing is almost the chief occupation of the population in the Government, the orchards are in a very neglected state, so far as various pests and fungus diseases are concerned, and one or the other of the pests appears yearly in enormous numbers and sometimes reduces the harvest to nothing. It is very difficult to persuade the Tartars to apply remedies, religious objections being raised, but even the Russian growers

only slowly realise the importance and necessity of protecting their orchards. The following pests are mentioned:—

On vines: *Polychrosis botrana*, Schiff.; only hand-picking is applied and, on very rare occasions, spraying. On apples: *Cydia* (*Carpocapsa*) *pomonella* was found after the 7th June; the author reports a new form of injury to the ends of the fruit-branches; *Hyponomeuta malinellus*, *Euproctis chrysorrhoea*, *Epicometis hirtella*, *Tmetocera ocellana*, *Anthonomus pomorum* and *Ornix anguliferella*. On pears: *C. pomonella*, *Psylla pyricola* and *Tingus pyri*. On cherries: *Rhynchites auratus* and *Eccoptogaster rugulosus*; the larvae of the latter were infected by *Chiropachis colon*, L., *Ecphylus hylesini*, Ratz., and some other unidentified parasites; cherries were also damaged by *Selandria* (*Eriocampa*) *adumbrata*, Klug. On quinces: *Euproctis chrysorrhoea* and to a certain degree *C. pomonella*. On plums and apricots: *Eurytoma schreineri* and *Lecanium* sp.

The condition of the market-gardens in the Government is better than that of the orchards and they suffer less from insects. *Laphygma exigua*, although very injurious in 1911, was not noticed in 1912; the most serious pest is *Gryllotalpa vulgaris*. Cabbages were damaged by *Colaphus sophiae* and by *Strachia ornata*. Radishes and turnips were injured by *Evergestis extimalis*, Scop., the biology of which is quite unknown.

Sacharov (N.). О ВРЕДИТЕЛЯХЪ ГОРЧИЦЫ [On the pests of Mustard].—*Published by* АСТРАХАНСКОЕ ОБЩЕСТВО САДОВОДСТВА, ОГОРОДНИЧЕСТВА И ПОЛЕВОДСТВА [Astrachan Horticultural, Market-gardeners' and Agricultural Society], 1913, 5 pp., 1 pl.

The cultivation of mustard is a very profitable one in the Government of Astrachan owing to its ability to withstand dry weather and its adaptibility to any soil; about 48,600 acres of mustard are cultivated there, being 3·9 per cent. of the total soil under cultivation. It does not require any special care after it has been sown, except for the attacks of injurious insects, which sometimes destroy the whole crop, and the author has therefore paid special attention to them.

*Phyllotreta atra*, F., is the principal pest, having several broods, but the first one is chiefly responsible for the damage done to the sprouting mustard, which is sometimes so great that the crop has to be resown. When the plants have established themselves the injury done is less significant. The beetles emerge when there are no weed Cruciferae on which they can feed, and they therefore concentrate on the sprouting mustard.

*Athalia spinarum*, F., passes through several generations during the summer, and breeds on mustard, as well as on wild Cruciferae. The eggs are deposited singly on the lower side of the leaves, each female being able to lay up to 300 eggs. The insect, egg and larva are described. Having reached its normal size the larva leaves the plants and pupates in the earth at a depth of about 1-1½ inches, wintering in the larval stage in its cocoon.

*Colaspidema sophiae*, Schall., has not been previously recorded as injurious, but last year's observations have shown that it does, both as a beetle and larva, enormous damage to mustard, as well as to cabbage and turnips. The imago and larva are described. The larvae usually live in company with those of *Athalia spinarum*. *Pieris daplidice*, L., is also a mustard-feeder. The caterpillars are attacked by many parasites, which destroyed last year up to 80 per cent. of caterpillars and pupae. Amongst the parasites are mentioned:—*Anilasta ebenina*, which kills the caterpillars in the third or fourth stage and pupates inside their skins; the author obtained three species of small hyperparasites of this parasite. *Pteromalus puparum* parasitises the pupae; *Chalcis flavipes*, which has not been previously noted as a parasite of this insect, was responsible last year for the destruction of about 50 per cent. of the pupae of *P. daplidice*; it also parasitises *P. rapae*.

The caterpillars of *Plutella maculipennis*, Curt., devour the young sprouts and pods and damage the leaves of mustard. It has many small parasites, not yet identified; and there are several generations during the summer.

*Lixus ascanii*, L., v. *albomarginatum*, Boh. Having described the larva, pupa and imago, the author deals with the injuries caused by this insect. The eggs are laid on the collar of the plants; the larvae passing inside, eat the core for some time, after which they descend into the roots, hollowing them out and leaving only the walls; pupation takes place in the root. Besides the above insects, mustard has also been damaged by species of *Mylabris* (*Zonabris*), the larvae of which devour the eggs of Italian locusts. These beetles eat away the tender parts of the plant, but in the opinion of the author, the harm done by them is minimal in comparison with their useful activity in destroying locusts; any remedy against them would lead to a multiplication of locusts, which would devour the whole of the mustard.

As to remedies, the author hesitates to recommend any owing to the inadequacy of his observations; spraying with Paris green or other arsenical preparations may prove useful, but he is unable to give formal recipes.

Sacharov (N). КАПУСТНЫЙ ЛИСТОЪДЪ И КАПУСТНАЯ ОГНЕВКА [*Phaedon cochleariae* var. *neglectus*, Sahlb., and *Pionea forficalis*, L.]—*Reprint from the journal* "САДЪ И ОГОРОДЪ" [*The Orchard and Market-Garden*]. *Moscow*, 1913, 7 pp.

Both these insects injure cabbages, turnips and other Cruciferae. *Phaedon* is a beetle of the family Chrysomelidae, and the author describes the imago, egg, larva, cocoon and pupa. The beetles do not jump when the leaves are touched, but drop to the earth, simulating death. The females eat a trough in the parenchyma of the leaves, on the lower side, the size of the trough

being equal to that of the egg; in such a trough one egg (rarely two) is deposited. The development of the egg takes 9-10 days; on leaves more exposed to the sun it proceeds more quickly. The larvae are very slow in their movements during the first portion of their life; they move on gradually, eating away the parenchyma and fouling the leaves with their excrement. The larval stage lasts 13-17 days, there being two moults during this time; 5-6 days after the second moult they pass into the earth, to a depth of 5-6 mm., where they form cocoons and pupate. The larvae are able to eject a liquid which serves them as protection against their enemies. The pupal stage lasts 12 days. The total number of eggs deposited by one female is 65-70. The insects winter as adults or as pupae. Early in spring the hibernated beetles feed on weed Cruciferae, passing on to cultivated market-garden plants as soon as they appear. Spraying with Paris green (about 1 oz. of green, and about 2 oz. of lime in 2·7 gallons of water) is recommended; a table-spoon of green soap or two spoons of flour paste ought to be added to this solution to make it more adhesive. This insecticide kills the imago in 2-3 days, the larvae perishing even before. If the pests have concentrated on single plants, the latter cannot be saved and ought to be removed and destroyed, taking care not to shake down the larvae; sometimes they attack only single leaves of plants, when the same must be done to these leaves.

As to *Pionea forficalis*, the author did not find these pests to the south of the Government of Moscow. He describes all the stages in the life of the insect. The eggs are laid in heaps of 15-25, the total number laid by one female in the laboratory being about 80. In the Government of Tver the insects are double-brooded. The wintering caterpillars pupate in the latter half of May, the imago appearing during the first half of June. They oviposit on cabbage, turnips, etc. The caterpillars of this generation pupate in the first half of July. In July and August the caterpillars of the second generation may already be noticed. These caterpillars are not able to produce an imago that year and pass into the earth where they winter in cocoons. Spraying with Paris green is also the best remedy for this insect.

Pospielov (V. P.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ ПРИ ЮЖНО РУССКОМЪ ОБЩЕСТВѢ ПООЩРЕНІЯ ЗЕМЛЕДѢЛІЯ И СЕЛЬСКОЙ ПРОМЫШЛЕННОСТИ ЗА 1912 [Report of the Entomological Station of the South-Russian Society for Promoting Agriculture for 1912].—*Reprint from the journal* "ХОЗЯЙСТВО." *Kiev*, 1913, 22 pp.

The author reports the results of experiments on the effect of carbon bisulphide ($CS_2$) against *Melolontha*, *Anomala aenea* and related species. A table illustrating these results is given and it appears that a dose of 5-7 grams of the insecticide injected into the soil to a depth of about 7-9 inches kills all the larvae round a root over a space of about 2½ inches from the point of injection.

Smaller doses injected not so deep or at a greater distance gave unfavourable results. It was further proved that 35-40 grams of carbon bisulphide injected to the same depth are sufficient to kill all the larvae in a space of about 5½ square feet. The Department of Agriculture requested the Station to examine the effect of carbon tetrachloride ($CCl_4$) owing to the inflammability of carbon bisulphide; but it appeared that this second remedy is much less effective than the previous one.

The author also gives an account of a conference of representatives of some Russian Railways and of the Committee of the Riga Exchange on means of preventing the spread of *Calandra granariae* in stored grain.

The remainder of the report is a series of small reports on the work of the author, the Director of the Station, and his assistants.

*Coeliodes fuliginosus*, Marsh., damaged some 135 acres of poppy in Podolia; the removal and destruction of the injured plants as well as reploughing in the autumn were recommended.

*Cassida nebulosa*, L., and *C. nobilis*, L., damaged beets in Charkov, the latter species appearing in smaller numbers; *Barathra brassicae*, L., occurred on peas in Poltava in July, and *Xylina exoleta*, L., on beets in Charkov.

*Eriophyes pyri*, Pagenst., were found on leaves of pear trees near Kiev; *Epicometis hirtella*, L., damaged blossoms of quinces in the district of Mohilev, in Podolia; the bark of apple trees mined by the caterpillars of *Sesia myopiformis*, Birkh., was sent from Volhynia; *Simaethis pariana*, Clerck, (*Choreutis parialis*) injured apple trees in the Government of Kiev; *Pammene rediella*, Clerck, occurred in unripe apples in a garden near Kiev.

*Hylastes ater*, Payk., has damaged pine seedlings in the Shershnev forest in Kiev. The larvae of *Lophyrus rufus*, Klug, damaged, in May, some 135 acres of pine plantations in the Zvenigorodsk forest in Kiev; hand-picking was adopted. Three species of Microlepidoptera, *Evetria (Retinia) buoliana*, Tr.; *Evetria (Retinia) duplana*, Hb., and *Dioryctria pinetella* have damaged the buds and shoots of young pines in Kiev.

Pospielov (V.). ОПЫТЫ ИСКУССТВЕННАГО ЗАРАЖЕНІЯ ОЗИМОЙ СОВКИ ЕЯ ПАРАЗИТАМИ-НАѢЗДНИКАМИ ВЪ КІЕВСКОЙ ГУБ. [Experiments on the artificial infection of *Euxoa segetum*, Schiff., by its parasites in the Government of Kiev].—*Reprint from the journal* "ВѢСТНИКЪ САХАРНОЙ ПРОМЫШЛЕННОСТИ" [*Herald of the Sugar Industry*]. *Kiev*, 1913, 11 pp.

This is a report on the studies of parasites of *Euxoa segetum*, Schiff., conducted at the Entomological Station of Kiev for several years. These studies had a twofold object: to rear parasites from specimens of the insects collected in the field and to

infect the latter artificially with its parasites in the laboratory. The following species of parasites have been reared from the hosts at the Station:—Ichneumonidae: *Amblyteles vadatorius*, Wesm, *A. panzeri*, Wesm., *Ichneumon sarcitorius*, L.; Braconidae: *Macrocentrus collaris*, Spin.; Chalcididae: *Trichogramma semblidis*, Aur.; Bombyliidae: *Anthrax flava*, Mg., *A. paniscus*, Rossi; Tachinidae: *Peleteria tesselata*, F., *Tachina larvarum*, L., *Cnephalia bucephala*, Mg., *Gonia capitata*, de G.

On the 1st May 1912, 28 pupae and 8 caterpillars of *E. segetum* were collected in a field which was seriously injured by the pests in the previous autumn; these specimens were found at a depth of some 3½ inches and put into an insectarium with the object of obtaining perfect insects. The latter began to emerge from the 22nd May, while on the 25th May the hatching of the parasites, *Amblyteles vadatorius*, started. The parasites were put into a metallic wire cylinder and fed with sugar syrup which was given to them through the wire on the top. The moths were put into an insectarium with earth in which some small plants of convolvulus were growing; between the 28th May and 2nd June the moths oviposited on the leaves and on the 1st and 5th June two lots of caterpillars were obtained, which were bred separately on convolvulus. On 17th June those of the caterpillars which had passed through all the moulting stages were put into a separate glass and kept for one day without food; on the next day they were offered to the parasites and infected by them. The parasites were placed in a bottle with a wide neck tied over with blotting paper, with a hole in the centre; the caterpillars were introduced into the glass by way of this hole, after which the glass was turned upside down; the object of the blotting paper was to absorb the ejections of the caterpillars and to help the parasites to clean themselves from this liquid. Every caterpillar was introduced singly and removed after having been infected; in this way 45 caterpillars were infected during the 18th June. Three caterpillars were immediately preserved in boiling water and spirit, the remainder were kept in the insectarium; 2-3 specimens were taken out every 3 days and preserved. On the 28th July only two pupae remained in the insectarium out of which two specimens of *A. vadatorius* emerged on the 31st July and 2nd August; thus the whole development of the parasites from egg to imago occupied 43-45 days. The second lot of caterpillars were infected by *A. vadatorius* on the 27th June and dealt with in the same way.

A similar experiment on infecting caterpillars of the second generation found on a sugar-beet plantation on the 7th August is also described; most of these infected caterpillars were also preserved; 4 of them were left to winter. Some specimens of *A. vadatorius* after having oviposited on some caterpillars on the 18th October lived in the laboratory till the 2nd November their total life being 85 days. When dissected after their death, their ovaries were found to contain a supply of immature eggs, and the author is of opinion that possibly these parasites, if

kept in a cold room, instead of a warm one, as was the case, would have lived through the winter.

An account is further given of the successful infection in the laboratory of larvae of *E. segetum* by the Braconid, *Macrocentrus collaris*. Up to 50 larvae of this parasite bred in one caterpillar of *E. segetum*, pupating afterwards in a common cocoon; it proved impossible to keep these parasites long, as they perished on the 6th day after they emerged. It was observed that *M. collaris* prefers to deposit its eggs on caterpillars which have just moulted, as the skin is then more tender, and particularly after the 2nd, 3rd and 4th moults. The mode of oviposition by these parasites is described.

Experiments on infecting the eggs of *E. segetum* are also recorded, the parasites being *Trichogramma semblidis*, Aur. On the 27th August some eggs of *Barathra* (*Mamestra*) *brassicae* were found in the field, out of some of which *T. semblidis* emerged on the 30th August. These then infected some eggs of *A. segetum* on the 2nd September, from which a new generation of the parasites emerged after 11 days. This parasite winters naturally in eggs of *Orgyia gonostigme*, *Gastropacha neustria*, *Lasiocampa* and other species.

The author further dwells on the possibility of obtaining a constant supply of *Trichogramma* during the winter months by providing the eggs in which they breed, and describes his own successful method of obtaining eggs of *E. segetum* during the winter. This insect hibernates as a fully grown caterpillar, ready to pupate, and very often it is noticed in the laboratory that the imago appears at the usual room temperature. At the end of December 1912, he obtained from such moths, eggs which were deposited between 8th and 24th January on sprouts of wheat, or directly on the earth in the cages; during the oviposition the moths were fed with sugar-syrup. There were no specimens of *P. semblidis* available and the eggs were left to develop. On the 17th January the first caterpillars appeared and were put into a thermostat at a temperature of 25° C. and fed on leaves of young wheat sprouts. After they had reached their fourth stage they were fed also on tiny slices of potatoes. At the time of writing, 28th February 1913, the caterpillars had completed their development and partly pupated. Thus it has been proved that the wintering caterpillars of *E. segetum* can be made to pupate and emerge, under suitable temperatures, at various times during the winter, and a constant supply of eggs can thus be secured, by the aid of which parasites can be artificially bred and multiplied.

Fulmek (L.). **Neuerungen im Pflanzenschutz (Zoologisher Teil).** [Innovations in plant protection (zoological part).] — Published by the author, Vienna, 1913, 17 pp., 6 figs., 1 pl.

This address to the "Erste österr. Gartenbauwoche," held in December 1912, is confined to general considerations regarding practical plant protection. Reference is made to the recent

growth of scientific institutions for this purpose. A table of pests is given and also one of insecticides with notes on their use. The application of secret preparations is very strongly deprecated.

**Kosten welche die Ausführung des Reblausgesetzes seit 1904 verursacht hat.** [Expenditure entailed since 1904 by the application of the Phylloxera law.]—*Der Weinbau im Grossherzogtum Luxemburg während der Jahre* 1912 *und* 1913, *unter besonderer Berücksichtigung der Reblausfrage, Grevenmacher,* 1913, p. 19.

Following on a former issue (1911) of a memorial pamphlet on vine-growing in the Grand Duchy of Luxemburg, the Distrikts-und Weinbauaufsichtskommissariat in Grevenmacher have published a 1913 edition of this "Denkschrift," on page 19 of which they give a table showing the cost of applying the Phylloxera law since 1904. The contributions of the growers, amounting to $\frac{1}{7}$th of the total for the 10 years 1904-1913, are included. This total amounts to about £10,438. Roughly $\frac{2}{3}$ths of this is for compensation paid; fees, salaries and wages are a little below this; whilst the cost of material was under $\frac{1}{3}$th.

Uvarov (B. P.). БОРЬБА СЪ САРАНЧЕВЫМИ ВЪ СТАВРОПОЛЬСКОЙ ГУБ. ВЪ 1907–1912 Г.Г. [The fight against locusts in the Government of Stavropol, 1907–1912.]—*Stavropol Entomological Bureau, Central Board of Land Administration and Agriculture, Department of Agriculture. St. Petersburg,* 1913, 87 pp., 7 maps, 5 tables.

The yearly invasions of the Government of Stavropol, as well as other parts of North Caucasia, by locusts go back to times immemorial, and the damage done by them is of very great economic importance. The author devotes his work to the history of the appearance of the principal species occurring in the Government—*Stauronotus maroccanus,* Thunb., *Locusta* (*Pachytylus*) *migratoria,* L., and *L. danica,* L.,—since 1907, giving a more or less full account of the extent of the outbreak in each year, the remedies applied, the organisation of the campaign, and its cost, and tracing the breeding places of the pests within the Government, as well as their invasions from the neighbouring Government of Astrachan from the north-east and from the Province of Terek from the south and south-east. Besides these species, there were also found during the last two years: *Caloptenus italicus,* L., *Celes variabilis,* Pall., *Tmethis muricatus,* Pall., *Oedaleus nigrofasciatus,* de G., *Arcyptera flavicosta,* Fisch. All these insects appear less frequently, and in smaller numbers, more or less in company with the principal species and do less, or even no damage. Chief amongst the

pests is *Stauronotus maroccanus*, which has its large and standing breeding-places in the south-eastern parts of the Government, where the hard, unploughed, clayey soil provides suitable spots for oviposition. The flora of these steppes consist of various species of *Artemisia*, *Festuca ovina*, etc. This breeding-place continues over the border into the province of Terek. In years of outbreak the insects spread to the north and northwest; and they prefer to oviposit in steppes lying near to cultivated fields.

The Asiatic locusts (*L. migratoria*) have their breeding-places in the lower valley of the River Kuma, where it is assumed that *L. danica* also breeds, as well as on the lower reaches of the Kalaus; but further investigations are necessary. The Government of Astrachan and the Province of Terek are also a constant source of supply of these pests, as the lower parts of Terek and the coast of the Caspian Sea serve as breeding-places for them. It has been often the case that locusts, coming from these parts have made fruitless all the operations and remedies applied in Stavropol against locally-bred swarms.

Up to 1910 only primitive mechanical remedies were applied in fighting the pests, such as driving them into pits, burning them with straw, crushing by various apparatus, etc.; the cost of these works formed an impost on the population of the neighbouring villages, who were not paid and were sometimes sent to assist in the campaign in distant parts of the country; they were controlled by the police authorities and never gave any definitely favourable results. Since 1910 spraying with insecticides has been used, the fight is carried on by paid workers and directed by entomologists and the results are very satisfactory. As insecticides, Schweinfurt green with lime is mostly used (4 to 5 lb. of green, with double this amount of caustic lime, in about 80 gals. of water); the amount of green varies according to the age of the insects. It has appeared that against *L. migratoria* hand-sprayers are preferable and more convenient, as it is very difficult to move amongst reeds with horse-sprayers; while horse-sprayers are more suitable in steppes or in fields. Against *S. maroccanus* the best results were obtained by Platz sprayers, which however require careful and experienced handling. At the beginning of the campaign the spraying goes on for the whole day, as then the insects in their 2nd and 3rd stages move about only during the hot hours, feeding in the morning and evening; when the groups of insects begin moving spraying is applied only at day-break and late in the evening. The most striking results are obtained if the insects are sprayed when settling down for the night. Besides Schweinfurt green, "Phitonal" was also used (about 10 lb. in about 80 gallons of water) but it killed relatively few larvae; while arsenic (about 2½ lb. in the same amount of water, previously boiled with lime) gave more definite results. In order to make the Schweinfurt green more sticky, so as to withstand the influence of the rainy weather, it has been found preferable to substitute zinc oxide (1 part to 3-4 parts of green) for the lime. The fight against

Asiatic locusts (*L. migratoria*) in 1910 gave no final results and in 1911 they appeared again and affected some 4,200 dessiatins (11,340 acres) in the Government. The operations against them cost more than 38,000 rubles (£4,000) and the pests were practically totally destroyed; in 1912 they appeared only in two limited areas, where they were again destroyed.

Spraying operations against *S. maroccanus* were started only in 1911, when their eggs were deposited over 190 square miles, and the spraying was successful in protecting the greater part of the harvest, at a cost of over £2,840; 14 per cent. of the crop was destroyed by the pests. In 1912 eggs were laid on an area of over 114 square miles, but spraying operations in the eastern part of the Government and a fungus disease (*Empusa grylli*) in the west led to a total destruction of the insects, and no new breeding-places could be discovered. Some farmers this year have used iron shields against the larvae with great success.

The total cost of the campaign against both species in 1912 was £740, an expenditure which was quite justified by the results obtained. However in the autumn of that year there again appeared large swarms of locusts from the Province of Terek and from Astrachan, which caused damage to crops estimated at £526, and they deposited eggs over about 93 square miles.

The author observed some grey flies (unidentified) amongst the locusts (*L. migratoria*) which remained behind on their halting places; these flies did not attack the resting or creeping locusts, but as soon as they started flying the flies immediately dashed after them; the author assumes that the flies oviposit on the flying insects. There were also found other unidentified parasites (*Mermis* sp. and others).

Moritz & Börner. **Prüfung von Reblausgiften.** [Testing of vine-louse poisons.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin,* viii, pt. 14, 1913, pp. 44-45.

Experiments were made to test the efficiency of "Saprosol," a patent preparation containing about 60 per cent. Kresol, in killing *Phylloxera*, and its effect upon the vines themselves. It was found that a 1 per cent. solution in water killed the *Phylloxera* at a temperature of 12°-15° C. in 10-15 minutes; 2 per cent. and 3 per cent. solutions were efficient in 5 minutes. Eggs were destroyed at a temperature of 18°-20° C. in a 3 per cent. solution in 20 minutes, in 4 per cent. and 5 per cent. solutions in 10 minutes. In 1912, 30,000 vines were experimented upon, consisting of 6,000 of each of five varieties. Each of these groups was divided into 24 bundles, each of 250 plants, half were treated with Saprosol, and the other half with water (other conditions being the same) for 10, 20 and 30 minutes respectively. Those treated with Saprosol were washed afterwards with water. The treated plants were then planted 1,

8, 15 and 22 days afterwards. Those planted at first had unfavourable weather (snow) to face; the third set planted had very favourable weather; but on the whole, when allowance has been made for this, it was found that by the autumn, in 62 rows, the Saprosol-treated plants were healthier than those treated with water only, while in 58 rows the reverse was the case. Between the plants treated for 10, 20 and 30 minutes there was no distinct difference to be noticed. A final statement of the results cannot be made before the autumn of 1913.

In these experiments the contents of the Saprosol used was in the following proportions: Kresol 60-65 per cent., alkalis 5-6·6 per cent., pure alkali ·24-1·4 per cent. (both reckoned as KOH), water 7-10 per cent.

Zacher. **Versuche mit Kornkäfern.** [Experiments with the corn-weevil.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin,* viii, pt. 14, 1913, p. 43.

Experiments were made to find out the behaviour of the corn-weevil (*Calandra granariae*, L.) towards acorns, especially those which are shelled and ground up for food for animals. In October 1911, 100 weevils were put in each of two glasses, one containing shelled, the other unshelled acorns. In the following June it was found that only those weevils had reproduced which had been given the shelled acorns; of the others 99 were dead. The weevils that had reproduced gave rise to 198 living and 48 dead imagines up to the time of counting. It seems therefore that even in the case of the shelled acorns, these are not so favourable for the weevils to breed in, as grain; for from 100 weevils fed on acorns 246 imagines were bred, while from the same number fed on grain 1,176 imagines were obtained in the same time.

Zacher. **Koloniale Schädlinge.** [Colonial pests.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin,* viii, pt. 14, 1913, pp. 41-43, 2 figs.

Specimens of diseased cotton plants were sent from Togo. An accompanying description of the disease stated that for the first 3½ months the plants had grown well, then a blackening of the twigs and green shoots had set in, and the roots became thickened. No specific cause of the damage had been found, but there was no doubt that it was caused by an insect; sections of the thickened roots showed that they had been bored as if by a Longicorn or weevil. Similar damage to cotton plants has been observed in German East Africa and was attributed to *Apion xanthostylum*, Wagn.

The plants were also suffering from other symptoms, very suggestive of the disease caused by the Buprestid beetles,

*Sphenoptera neglecta*, Klg., one of the most dreaded pests of cotton. The borings of this insect are in the upper parts of the stems, and are spirally twisted.

Maassen & Behn. **Uber ein neues Mittel gegen die Faulbrut.** [A new remedy for Foul-brood.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin*, viii, pt. 14, 1913, pp. 47-48.

A new method of curing and preventing foul-brood has been recently recommended in papers upon bee-keeping. This remedy, called "Imkerat" is a cloudy, yellowish-brown liquid of a syrupy consistency. Its efficiency in cases of foul-brood has been tested, and the experiments showed that it cannot be regarded as a remedy for this disease; the epidemic persisted in spite of treatment, and treatment did not prevent the spread of the disease to healthy hives.

Busck (A.). **Two Microlepidoptera injurious to Chestnut.**—*Proc. Entom. Soc., Washington*, xv, no. 3, Sept. 1913, pp. 102-103, 1 fig.

Two new species of Microlepidoptera are described, both of which were taken from the chestnut tree, which they are said to damage, though in what respect is not stated. The first, *Sesia castaneae*, breeds in the trunk of the tree; it resembles *S. pictipes* somewhat closely, but differs in the markings on the wings and body. It was found at Lynchburg, Virginia, and at Snow Shoe, Pennsylvania. The second, *Ectoedemia castaneae*, was bred from small galls on young twigs of the chestnut, recalling in form and size the egg-masses of the forest caterpillar. It was taken at Victch, Virginia.

Sasscer (E. R.) & Pierce (W. D.). **Preliminary Report on the finding of a new Weevil Enemy of the Potato Tuber.**—*Proc. Entom. Soc., Washington*, xv, no. 3, Sept. 1913, pp. 143-144, 2 pls.

In May of this year a number of potato tubers (*Solanum tuberosum*) were received from the neighbourhood of Huarochiri, Peru, and upon examination were found to be mined by a weevil and also by the potato-tuber moth (*Phthorimaea operculella*, Z.). Material infested with larvae, pupae and adults of the weevil was received from the following localities during May:—Cuzco, Temuco, and Arequipa, Peru; Oruro, Bolivia; and Ancud or San Carlos and Castro Islands, Chile. In many cases injury occasioned by these weevils was quite noticeable. A few of the tubers, superficially sound, on being opened were found to be infested. Two adults were kept alive from 24th May to 6th September, during which time they fed but little, and then only on potato foliage. The insect was determined by one of the authors

as *Rhigopsidius tucumanus*, Heller, a species originally described from Tecuman, Argentine. It belongs to the sub-family Rhytirrhininae.

Walton (W. R.). **Efficiency of a Tachinid Parasite on the last Instar of** *Laphygma*.—*Proc. Entom. Soc., Washington*, xv, no. 3, Sept. 1913, pp. 128-131, 1 table.

Taking advantage of an abundance of *Laphygma frugiperda* occurring in the grounds of the Department of Agriculture at Washington, experiments were made regarding the efficiency of Tachinid parasites upon the last instar of the caterpillar. As this instar is of longer duration than the previous ones, it seems that the caterpillar is then more open to attack by the parasite than in the first instar in which the eggs are often thrown off at the moult.

Twelve caterpillars of *L. frugiperda*, all bearing parasitic eggs, were kept under similar conditions and watched. Regarding (1) the effectiveness of parasitism, this is very high for this species of parasite, as in all cases the host was killed; (2) as regards the maximum number of adult Tachinids to issue from a single host, it was found that in one instance the number was 3, in five cases 2, and the rest bore but a single parasite; (3) the effect of supernumerary eggs varied inversely with the degree of development of the resulting adults, that is to say, where the caterpillar bore many eggs, the adult parasite was smaller than when only one or a few eggs were borne by the host; (4) the species of Tachinid reared was *Winthemia quadripustulata*, F.

Subsequent to making these experiments the author saw Dr. Nielson's paper upon *Tachina larvarum*, L., and its parasitism on *Zygaena filipendulae*. The two sets of experiments agreed in essentials; Dr. Nielson however adds that in cases where several flies emerged from the same host, their size was not equally reduced, one or two of them not differing in size from that of flies which had developed solitary, the remainder being undersized.

In discussing the paper Mr. Pierce stated that in the south he had found *Chelonus texanus*, Cresson, which laid its egg in the egg of *Laphygma*, to be a much more efficient parasite than the Tachinid mentioned by the author; he said that *Chelonus* caused a total mortality and emerged from the third or fourth instar of the *Laphygma* larvae.

**How to make Bordeaux Mixture adhesive.**—*Agric. Gaz., N.S. Wales, Sydney*, xxiv, pt. 10, Oct. 1913, p. 868.

The following are the principal conclusions of experiments made at the Viticultural Station of Villefranche-sur-Saône on the processes adopted for the purpose of giving adhesive properties to spraying mixtures used for vines. The addition of

gelatine gives solutions great superficial vicosity, and it is advised that it be added to copper mixtures to make them adhesive. Gelatine, 3 oz. to 8 oz. per 100 gals., can be used for Paris green and for acid Bordeaux mixture and Burgundy mixtures; alkaline substances present in a mixture renders the gelatine insoluble, thereby diminishing its viscosity. Among substances costing little, which can take the place of gelatine, casein gave the best results. A very adhesive spray is made by adding 3 oz. to 8 oz. of casein dissolved in a small quantity of milk of lime to Bordeaux mixture prepared in the ordinary way. In an acid medium, casein is insoluble and therefore useless. Milk of lime may be made by mixing slacked lime with water sufficient to make a milky liquid. It is suggested that the casein be dissolved by the following process: mix intimately 3½ oz. of powdered well-burnt lime with 1½ oz. of powdered casein. Add to the mixture very little water and work it well into a paste. Thin it down with successive small quantities of water till about a quart of liquid is obtained, which is then to be added to the Bordeaux mixture.

**Trial of "Safonia" Spray at Yanco.**—*Agric. Gaz., N.S. Wales, Sydney,* xxiv, pt. 10, Oct. 1913, p. 886.

A sample of "Safonia" spray was received from the manufacturers and forwarded to the Yanko Experiment Farm for trial as a destroyer of aphis, caterpillars, etc. Two applications were made with a bucket spray pump on 5th and 18th June 1913, on a row of mixed cabbages and a row of Early London cauliflowers. The rows were about 40 yards long, and at the first application 3 gals. of the mixture were used at the rate of a pint of "Safonia" to 4 gals. of water, and at the second application 6 gals. were used. The plants were thoroughly sprayed, top and bottom, and as a result all the aphids were killed, even though some of the plants were badly infested.

Zacher (F.). **Literaturbericht über Schädlinge von Kakao, Kaffee und Tee (1906-12).** [Literature on pests of cacao, coffee and tea plants.]—*Zeits. für Wissen. Insektenbiol., Berlin,* ix, pt. 10, 15th Oct. 1913, pp. 317-320.

This paper gives the literature of pests of cacao, coffee and tea, with a brief summary of the contents of each work mentioned.

Werner (F.). **Massenansammlung von *Coccinella*.** [Swarming of *Coccinella*.]—*Zeits. für Wissen. Insektenbiol., Berlin,* ix, pt. 10, 15th Oct. 1913, p. 311.

In reading the account of Carnes of the hibernation in mountains of the Coccinellid *Hippodamia convergens*, which has proved a very useful enemy of the leaf-louse in Californian

melon plantations, the author brings to mind certain observations which he made in August 1901, while climbing the Bithynic Olympus, near Brusa in Asia Minor. In protected spots on the mountain peak there were many thousands of ladybirds (*Coccinella septempunctata*), crowded together in a lethargic condition, doubtless owing to the low temperature and the neighbouring snowfields. Whether these ladybirds were already collected together to hibernate or what other cause brought them there in such numbers is not known.

Kurdjumov (N. V.). **Notes on *Tetrastichini* (Hymenoptera, Chalcidoidea).**—*Revue Russe d'Entomologie, St. Petersburg,* xiii, no. 2, 20th Oct. 1913, pp. 243-256, 8 figs.

The following notes are partly a result of the author's own studies of some Russian representatives of this group of insects, and partly of his acquaintance with the collections of Förster, Mayr, Ratzeburg and Ashmead. In the tables accompanying the notes 9 genera are described, of which 6 are found in Europe, while three, possessing two-jointed funicles, have thus far been observed only in America and in the Hawaiian Islands. The following genera have not been included in the tables:—*Tetrastichodes*, Ashmead, *Trichoporus*, Förster, *Gyrolasia*, Förster, *Syntomosphyrum*, Förster, *Ceranisus*, Walker, and *Baryscapus*, Förster. The author is of opinion that the genus *Tetrastichodes*, notwithstanding the absence of a line on the mesonotum, is synonmous with *Geniocerus*, Rtzb.; that the genus *Trichoporus* is synonymous with *Astichus;* that *Gyrolasia* is a synonym of *Pteroptrix*. Westw.; that the genus *Syntomosphyrum* cannot be upheld, the various species included in this genus belonging either to *Tetrastichus* or *Geniocerus*, while the species, *S. indicum*, being a parasite of *Ceratitis capitata* (Prof. Silvestri), ought to take its place as a sub-genus in the genus *Mellitobia; Ceranisus* and *Baryscapus* differ from the other genera by the strongly thickened scape of the antennae, a character which, in the opinion of the author, is found only in the males. Some species of *Tetrastichus*, as well as of *Geniocerus*, have also a swollen scape. The genus *Tetrastichus*, Hal., is, according to the author, not synonymous with *Geniocerus*, Rtzb.; the typical species of *Tetrastichus* (*Eulophus miser*, Nees) has only one bristle on the submarginal vein, while the typical species of *Geniocerus* (*G. erythrophthalmus* = *Eulophus roesselae*, de Geer) has several bristles.

Kurdjumov (N. V.). **Notes on European species of the genus *Aphelinus*, Dalm. (Chalcidoidea), parasitic upon Plant Lice.**—*Revue Russe d'Entomologie, St. Petersburg,* xiii, no. 2, 20th Oct. 1913, pp. 266-270.

The species of this genus, which are very numerous, are primary parasites of Aphididae, the females ovipositing in the

very young hosts. The egg is long and bent in the middle, resembling the eggs of other Chalcidoidea. The larva is practically globular, with a small head and a short tail appendix. About one week after the egg has been deposited the aphis dies, turning a dark blue colour. The whole cycle of development of the parasite lasts 18-22 days, from the middle of July to the middle of August; later in the season, when the temperature is lower, the time of development is longer and in the hibernating stages it lasts several months. The parasite hibernates in the pupal stage, principally inside the sexual forms of the host, as the author has satisfied himself in a case of *Aphelinus subflavescens*, Westw. These parasites appear to attack Aphids less frequently than do Braconidae.

The author gives a synoptic table of the European species with hairy eyes, including some species named by A. Förster, but not described by him, viz., *flaviventris*, *dubia*, *brachyptera* and *daucicola*.

Jatzenkovskij (E. V.). НѢСКОЛЬКО МЫСЛЕЙ ОБЪ ЭНТОМОЛОГИЧЕСКИХЪ СТАНЦІЯХЪ. [On the functions of Entomological Stations.]—*Revue Russe d'Entomologie*, *St. Petersburg*, xiii, no. 2, 20th Oct. 1913, pp. 336–341.

The author points out that, owing to the peculiar conditions obtaining in Russia, the purely advisory work of entomologists, based on foreign experiments and scientific study, cannot prove of much practical value; for besides this scientific knowledge, the entomologist ought also to know which remedies are the best in a given case, and how far they are economically possible for the local population. Thus the entomological stations must provide for two lines of action—practical field work and purely scientific investigation. Just as the eradication of locusts has been made a national question, the fight against other pests must also take the same course.

The author puts forward the following rough outline of the functions of practical organisations of this kind:—(1) Exact registration and study of local peculiarities in the biology of various pests; (2) in cases in which the spread of the pests assumes the character of a national calamity, the stations must provide the necessary remedies, by means of special funds which must always be under the control of the Director of the institution; (3) they must acquaint the population with the biology of various pests and remedies against them; (4) they must conduct experimental remedial measures, in order to educate the population, which will thereafter be able to apply its own remedies in case it is impossible to organise a national campaign; (5) they must reply to the various inquiries with regard to injurious insects in the district.

These stations must also have experimental departments, or a special experimental station must be provided, where the pests must be studied under natural and artificial conditions, as well as their parasites, etc. The activity of such stations cannot be properly controlled by a central authority, but conferences, congresses, etc., can to some extent supply the necessary co-ordination.

Jatzenkovskij (E. V.). НѢКОТОРЫЯ ДАННЫЯ КЪ БІОЛОГІИ САРАНЧИ. [Some data on the biology of locusts (*Locusta migratoria*, L.).]—*Revue Russe d'Entomologie*, *St. Petersburg*, xiii, no. 2, 20th Oct. 1913, pp. 323–335, 11 figs.

An account of the pairing habits and oviposition of these locusts, as observed in the Government of Stavropol. The author states that the shape of the egg-masses varies in accordance with the soil in which they are deposited.

Jatzenkovskij (E. V.). НѢКОТОРЫЯ ДАННЫЯ ПО ИСТРЕБЛЕНІЮ МАРОККСКОЙ КОБЫЛКИ ВЪ СТАВРОПОЛЬСКОЙ ГУБ. [Some details of the destruction of *Stauronotus maroccanus* in the Government of Stavropol.]—*Revue Russe d'Entomologie*, *St. Petersburg*, no. 2, 20th Oct. 1913, pp. 342–359, 3 figs.

The author spent the spring and part of the summer of 1912 in the Government of Stavropol, where he was controlling the operations against *S. maroccanus*, and this is practically a report of the campaign, being more detailed than that by Uvarov. The hatching of the pests took place principally from the 3rd to 5th and 16th to 18th May and in a smaller degree from the 8th to 10th and 21st to 23rd May. After hatching, the insects lay for some time motionless near the egg-clusters and very soon started to collect in large companies ("kuligi"). During the first two moulting periods the pests moved towards the east or south-east; after this their movements were less regular and the exact direction could not be ascertained. The "kuligi" move with a gradually increasing speed, the latter reaching occasionally as much as 1,400 yards a day. The locusts began flying in the first half of June.

The author considers the chemical remedies—spraying with insecticides—as being the most effective and affording a reliable protection against the pests. The mechanical remedies, as applied previously, proved very unsatisfactory and had to be forbidden, as, owing to the dispersion of the "kuligi," they interfered with the efficiency of the spraying; this applies specially to burning with straw.

PAILLOT (A.). **Coccobacilles parasites d'Insectes.**—*C.R. de l'Acad. des Sciences, Paris,* clvii, no. 15, Oct. 1913, pp. 608-611.

Entomophytic bacteria, and in particular, their usefulness in combating harmful insects, have been the subject of much recent work. The present author succeeded, in May last, in discovering a bacillus in caterpillars of *Gortyna ochracea* (a pest of the artichoke) causing an epidemic disease among them. At first the diseased caterpillars were little different from the healthy ones, but later they lost the use of their legs, all except the first pair, and the posterior part of the body seemed to have lost all sensation; after death the body quickly decomposes. Microscopic examination showed the presence in the blood of a great many mobile coccobacilli, often paired in twos, some in the coccus form and others rod-shaped. In the case of *Gortyna,* death is brought about by septicaemia.

In the tissues of apparently healthy caterpillars of this species, bacilli have been observed; it is possible that certain of them are immune from the disease, which would account for the fact that in some cases, in which injections of the bacillus have been made, disease did not always result, whereas when the same injections were made upon caterpillars of another species, *Lymantria dispar,* for example, disease invariably resulted. According to recent researches, it would seem that such bacterial parasites are not uncommon in insects; on examining the tissues and blood of caterpillars of *Pyrameis cardui,* the author isolated two different coccobacilli. Following the custom of previous authors, he has separated the coccobacilli of *Gortyna* and *Pyrameis* from others under the names of *Bacillus gortynae, B. pyrameis I.,* and *B. pyrameis II.*

BENTLEY (G. M.). **Suggestions on preparation and use of spray formulas.**—*Bulletin of the Agricultural Experiment Station of the University of Tennessee, Knoxville,* no. 99, April 1913, pp. 63-82, 8 figs.

Besides a very full list of formulae the author gives practical suggestions on their preparation and use and the illustrations given are of a useful character. A simple, cheap and effective emulsifier is figured and described, for use with kerosene and soap mixtures. It consists essentially of a tin cylinder with a cover and a hollow conical plunger with holes in it; the cylinder is 18″ long and 4″ in diameter; the plunger is a ¼″ iron rod fitted at the end with a tin cone 3½″ high and fitting the cylinder easily; ½″ from the base of the cone 5 holes, each ¼″ in diameter, are made at regular intervals and about 1″ from the end of the cylinder are 7 holes of the same size. It is claimed that the use of this simple device produces a perfect emulsion. Prof. H. A. Morgan of the Louisiana Experiment Station, Baton Rouge, is the inventor.

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